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CONTENTS

Ultra High Speed Technics in Dentistry for Children, *Jerome L. Fechtner, D.D.S.* 231

Unit News 257

Tranquilizers in Dentistry for Children, *David H. Shamer, D.D.S., Douglas J. Sanders, D.D.S., and Edward C. Dobbs, D.D.S.* 269

Jacob M. Wisan, 1896-1958 274

Adverse Factors in the Developing Occlusion, *Naomi A. Dunn, D.D.S., and Irving W. Eichenbaum, D.D.S.* 275

Abstract 288

Dental Caries and a Consideration of the Role of Diet in Prevention . 289

The Constitution and By-Laws of the American Society of Dentistry for Children 298

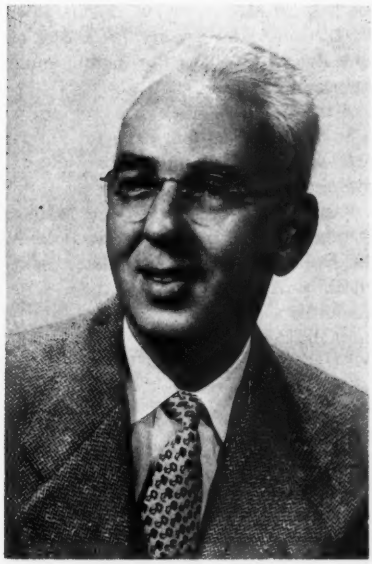
Pedodontic Terminology, *L. W. Teutsch, D.D.S., M.S.D.* 305

Topical Treatment of the Teeth With Stannous Fluoride, *Joseph C. Muhler, D.D.S., Ph.D.* 306

Book Reviews 310

Index—Volume XXV 313

Our New Executive Secretary



Next time you attend a National Meeting of the A.S.D.C., look around for the gentleman whose photo appears above. He is C. Frank Tuma, D.D.S., our new Executive Secretary, beginning January 1, 1959.

Frank Tuma has been a member of A.S.D.C. for approximately 25 years, and has served two terms as a member of our Executive Council. He served as general chairman of our 1953 Annual Meeting in Cleveland and has been general chairman of the famous Children's Dental Health Day of the Cleveland Dental Society and has held many elected offices and committee chairmanships in the Cleveland Dental Society during his 30 years of membership.

We suggest that you direct your future letters concerning the business of the A.S.D.C. to:

DR. C. F. TUMA, *Executive Secretary*
American Society of Dentistry for Children
13201 Miles Avenue
Cleveland 5, Ohio

NOTICE

The Kenneth A. Easlick Graduate Society is pleased to announce that its next meeting will be held in Ann Arbor, Michigan, April 13-15, 1959 at the Kellogg Foundation Institute. Dr. Samuel Pruzansky of the University of Illinois and Dr. Frank Popovitch of the Burlington, Ontario Research Center will be featured essayists.

Other highlights of the intensive three day program will include research reports and lectures on Therapeutics and Behavior Problems of the Preschool Child. Members will participate in panel discussions on various clinical problems encountered in the every day practice of pedodontics.

The Kenneth A. Easlick Graduate Society was founded at the University of Michigan Dental School in April, 1957. It was conceived by former graduate students in pedodontics who were stimulated to continue their study after graduation.

The objectives of the Graduate Society are:

1. To promote high standards in the practice of dentistry for children
2. To be informed of the most recent developments, theories, technics and research in pedodontics
3. To exchange ideas with graduate pedodontic groups at other schools of dentistry

Meetings are held biennially and active membership is limited to those students who have received a degree of Master of Science in Pedodontics from the University of Michigan.

The membership of the Easlick Society feels that to achieve the objectives set forth in the Constitution is but one method of bestowing honor on one of this country's foremost dental teachers, Kenneth A. Easlick.

Ultra High Speed Technics in Dentistry For Children

JEROME L. FECHTNER, D.D.S.

OUTLINE

A. Purpose
B. History and Review of the Literature
C. General Considerations in the Use of Ultra Speed
   1. Visual Control
   2. Thermal Control
      a. Water coolant
      b. Water evacuation
   3. Digital Control
D. Operative Technics
E. The Ultra Speed Instruments
   1. The Belt Driven Instruments
   2. The Air Driven Instruments
F. Summary

PURPOSE

The purpose of this paper is to provide a clinical evaluation of the use of ultra high speed rotary instruments in the practice of dentistry for children. With the advancements and changes in rotary cutting instruments and technics since 1945, it must be emphasized at the outset that the choice of cutting instrument or handpiece is secondary to the maintenance of sound clinical practice. The fundamental principles of good restorative dentistry for children have been modified and improved by constant research and clinical experience. A reappraisal of previous technics is required because of the development of the new ultra speed instruments and changes in classic cavity preparation as advocated by Brown,[10] Hartsook,[19] Hyett,[31] Ingraham and Tanner,[33] and Lampshire.[43] It is the premise of this paper that the fine principles of operative dentistry for children need not be sacrificed with the introduction of increased operating speeds. Peyton and Henry[67] assume that "the operation should be completed with the least possible pain and discomfort to the patient, as well as a minimum of pathological disturbance to tissue involved. In addition, the operation should involve a minimum of apprehension and psychological response in the patient, with the least possible fatigue for the operator. The instrument should be chosen and employed under conditions which provide the most efficient removal of tooth tissue with economy of time for both patient and operator, yet preserve the most favorable physiological conditions within the patient. In addition, instruments should be employed which yield a maximum operating life, or a minimum replacement cost, for the effective removal of the required amounts of tooth tissue." Ultra speed instrumentation fulfills these principles of the dental operation if properly adapted and performed with necessary skill and judgment. Technics will be described which will enable the dentist to adapt ultra high speed to the practice of dentistry for children and maintain all fundamental concepts and principles.

HISTORY AND REVIEW OF THE LITERATURE

The study of history is especially important in order to gain a view of the total overall picture and place a problem in its proper perspective. In the heat of controversies of new develop-

ments and technics, the immediate situation may often take on a different perspective when it occupies its proper small niche in the passage of time. It is an easy matter to peer into the past and minimize advances and developments which are accepted as fundamental principles today; and it is a difficult matter not to overemphasize the advances and developments which are occurring at the present time. Because of the urgency of time, present problems loom large in our mind's eye and it is almost impossible to assign them their proper place and perspective in the general passage of time and development of operative dentistry. Present discussions of high speed or ultra speed in dentistry are topics arousing keenest interest, often provoking stimulating and controversial dental meetings. However, a review of the past literature will reveal that our present developments are merely one more logical step in the progress of operative dentistry. Each advance is made possible by the research and ideas of the men who have gone before us. Each step forward has usually been along a rocky path of criticism, and this is a healthy thing. Criticism helps to refine and improve useful developments, and also to weed out and eliminate that which deserves no place in the path of progress.

The story of operative dentistry begins when cavity preparation was done entirely by chisels and gouges made of steel or iron. When the first rotary instruments were developed about 75 years ago, even they "were operated by hand, of course, until someone in a hurry, like Dr. Morrison in the 1870's tied the rotary device to his foot, and then the foot and treadle equipment became popular. . . . It was the adaptation of the electric motor to rotary instruments which really stirred up a storm of controversy. Dr. Pedley in 1895 recommended the use of hand driven rotary instruments, since the dental engine was a 'formidable instrument in the hands of the novice.'[61] However, the dental engine was finally accepted because of proved advantages, and a satisfactory technic was developed for its use."[57] In 1959 it seems incredulous that such controversy could exist over the use of the dental engine which is our basic tool. And perhaps in 20 years our discussions of today may seem to be "much ado about nothing." But we must make our decisions as to technic now, while we are in a state of change and evaluation.

In 1900, fear of injury to the tooth and soft tissue was so great, that the "speed of the electric motor was kept down virtually to that attained by the foot engine. As early as 1890, however, higher speed was advocated by a New York dentist who stepped up the electric motor so as to attain a speed of 5,000 RPM. His contention was that by briefly touching successively the dentin to be excavated, sensitive cavities could be prepared with much less pain because the minimum pressure on the bur caused less frictional heat."[2]

It becomes quickly obvious that present day discussion of frictional heat, higher speeds and lighter operating pressures are not new and revolutionary ideas, but merely natural technical refinements and advances made possible by past research and ideas of a half century ago. Despite the fact that rotary instruments were introduced so long ago, general operative technic advocates the use of instruments such as chisels, hatchets and hoes. If these hand instruments maintain the high calibre of dentistry, then they should be retained, no

matter what "faster" instruments may be developed. But when instruments and technics are developed with sound principles, they should be tested and evaluated, always keeping in mind the quality of the final operation. Under no circumstances should an instrument or technic be adopted unless it maintains or improves the quality of dentistry which may be performed by the operator.

Advances in technic often cause other and sometimes unforeseen problems to arise. With the use of rotary steel burs, the problems of heat and trauma arose, and so technics, such as low rotary speed, and light, intermittent cutting were used. Since the steel bur was not hard enough to cut through the enamel, carborundum stones were used to gain access. Cavity preparation was a long and tedious process because of repeated changing of burs and instruments, and repeated applications of air or water to the tooth to cool it down. So much heat was generated within the tooth that the theory was advanced by some dentists that it was dangerous to use local anesthetics to control pain, since the patient could give the dentist no warning when the tooth became dangerously hot, thus possibly endangering the pulp.

In order to keep the tooth and pulp within safe biological temperature ranges, a method was sought which would reduce the heat generated during cavity preparation.[35] Many dentists still prefer to operate at normal speeds of 2,000-10,000 RPM in a dry field. Yet, consider the analogy of "a continuous steel lightning strip with blades like a cross-cut fissure bur against vital dentin and pull it across this sensitive tissue at the rate of twenty-five feet per minute—dry! One would not do this because of obvious frictional trauma, yet this visualizes just about what happens when the average dentist uses a No. 558 cross-cut steel fissure bur at 2,000 revolutions per minute, or second speed . . . friction developed by steel burs is appreciable and dangerous, and persists even during gentle operating with the smallest burs. Dental students are taught (1944) that burs are best used in the dry state, that dry burs cut faster and more painlessly than wet ones. The precise truth is the exact opposite, because in the wet field, frictional heat is negligible."[23] As long ago as 1928, Bodecker,[6] Bronner[8] and Jeserich[35] discussed the clinical dangers of frictional heat. In the thirty years which have elapsed, many eminent and careful researchers have measured and tested the heat created by various rotating instruments at different speeds and pressures. It is beyond the scope of this review of the literature to discuss these tests and results in detail. The reader may desire to study the excellent work reported in the papers of Anderson and Van Praagh,[3] Henschel,[21, 22, 23, 24, 25, 26] Hudson and Sweeney,[28] Lammie,[42] Lisanti and Zander,[48] Peyton,[65, 71] Vaughn and Peyton,[84] Walsh and Symmons,[85, 86] and Willis and Worner.[88]

Each and every investigator reached the same basic conclusion that at ANY rotational speed, heat is the great and primary danger to the health of the tooth and pulp. The temperature range of safety within the pulp is narrow, and McMaster and Hudack[54] show destructive tissue changes at 106° F., which become irreversible at 110°-113° F. When thermocouple experiments on extracted teeth show temperature rises of from 270° F.[23] to even 1,000° F. under excessive, abusive grinding,[47] it proves the need for some practical method of cooling the tooth while grinding.

The search then began for technical improvements and apparatus for auto-

matic cooling of the tooth or bur during operation. A stimulus was provided during World War II, when dentists from different parts of the country exchanged ideas in military dental clinics. They met the problem of completing large quantities of operative dentistry in the short periods of time for which the inductees and servicemen were available for treatment. With the availability of dental corpsmen as chairside assistants, a stream of water was directed by syringe at the tooth and bur during cavity preparation. This required the operator and assistant at the same time to keep heat production within biological limits so that much urgent dental treatment was provided in the shortest possible time. After the war, when a constant chairside assistant was not so readily available, many methods of automatic cooling were attempted such as water,[4, 24, 30, 64, 67] air,[65, 69] refrigeration,[15, 25] chilled burs,[79] an air-conditioned handpiece[12] and others.[46, 47, 62, 74]

In 1949, another technical development, the use of the tungsten carbide bur instead of the steel bur caused further impetus to the acceptance of a water or water-air spray to the tooth. The carbide bur cut better and more rapidly than the steel bur; but it had to be operated at higher speeds in order to be efficient.[42, 61] At about the same time, diamond rotary instruments were introduced for enamel cutting and reduction which were more efficient than carborundum stones. The use of large diamond instruments also required higher speeds which generated dangerous amounts of heat.[18] "There are other reasons why a coolant is needed that are closely allied to the problem of control of excessive heating. A coolant prevents diamond instruments from becoming smeared or clogged. When a rotary instrument becomes clogged, it loses its efficiency and as a result creates more heat. An effective coolant also acts as a lubricant for the cutting operation and to a small extent cushions vibration."[14]

The factors influencing thermal change during tooth preparation are aptly put by Panzer:[62]

a. The size, sharpness, and speed of rotation of the instrument.
b. The amount of pressure applied to the instrument.
c. The direction in which the pressure is applied. That is, whether it is a vertical or a lateral pressure, or a combination of both.
d. Whether the pressure is sustained or intermittent.
e. Whether the field is dry, moist or wet.

In view of the unanimity of the opinion of all researchers that there is great danger from production of heat, and that a water or water-air spray coolant be used, it is emphasized and assumed that this be a basic adjunct of all high or ultra high speed technics which will be evaluated in this paper. It is urged that the operator learn to work with a flow of coolant at all times when operating with carbides or diamonds at the higher speeds. To ignore this is to invite disaster and literally cook the pulp to death. The only possible disadvantage of a water spray is the fact that the operator must learn to practice and adapt his technic so that his vision will not be impaired by the coolant. Methods of obtaining better vision are discussed in another section of this paper. Only with the constant use of a water coolant in large quantities can any high or ultra speed technic be recommended. It is further suggested that the use of a water coolant be adapted to ALL speeds.

In summary, the following advantages of using a coolant are listed by Doerr:[14]

1. Eliminates heat.
   a. Less pain.
   b. No pulp damage due to heat.
   c. Continuous operating possible.
2. Keeps cavity cleaned out.
3. Prevents clogging of rotating instruments and subsequent loss of efficiency.
4. Acts as a lubricant.
5. Cushions vibration to a minor degree.
6. Life of burs and stones is increased because cleaning operations, which tend to dull are unnecessary.
7. Removal of old restorations is facilitated.
8. Less anesthesia necessary—pulp is protected from thermal trauma with or without anesthetic.
9. Psychological.
   a. Patient co-operation is encouraged.
   b. Distracts attention from operative procedure.

In a review of the literature it may be noted that the use of the term high speed, and the cautions in advocating a "speed limit" change with each year. In 1954, Adams[1] recommended a gradual training period of several months or a year to reach a top operating speed of 18,000 RPM. Doerr,[14] in 1955, recommends a range of 12,000 to 18,000 RPM. Disadvantages of high speed listed in 1954[2] are the amount of time necessary to learn and practice with the new technic, and also the problem of working with a coolant. As recently as 1956, Brunner[11] mentions that the highest speed of 200,000 RPM is beyond the obtainable limit. In 1955, Chayes[13] describes the optimum speed in engineering terms of 5,000 to 9,000 lineal feet per second.[80] This, of course, means that it is not only the rotational speed of the instrument which affects the cutting, but the size of the cutting instrument. Obviously, a cutting instrument of twice the circumference, need only turn half as fast, in order to equal the lineal feet per second of a smaller instrument. Therefore, as rotational speeds increased, the size of the cutting instruments was reduced. Also, at certain intermediate speeds, vibration of the angle or bur became a severe problem.[20] At the higher speeds it was necessary to use fine, true running instruments to avoid vibration.[32] All of these developments contributed to less pain and greater comfort for the patient.[27, 41] An occasional voice in the literature objected to high speeds because of the possibility of accidents.[44, 73] All writers cautioned as to heat, care and judgment in the use of high speed.

With the realization that water spray coolants permitted the safe use of higher speeds with carbide and diamond instruments, the search was on for handpieces and contra-angles which would deliver the required speeds. The first obvious step was to increase the speed of handpieces, angles and motors which were then in current usage. With slight alterations in their dental units, Beebe[4] utilized speeds of up to 20,000 RPM. The conversion of standard dental units of various makes is a simple one which may be done by the dentist or the local equipment service man. All that is necessary is to disconnect the high speed resistors which are in the chassis of the dental unit. This will give a speed of 9,000 to 11,000 RPM at the high forward speed of the foot controller. If it is desired, a toggle switch may be placed in this line to give five forward speeds instead of four. In addition to his conversion of the unit, a driving pulley with a larger diameter will give a simple mechanical ratio which will greatly increase the speed of the belt delivered at the handpiece. These two simple equipment changes will permit handpieces and contra-angle speeds up to 20,000 RPM. However, certain precautions are necessary since the equipment was not designed

for those speeds. The motor must be properly and frequently lubricated and the commutator carbon brushes should be checked often, as they wear down faster at the higher speeds. A high speed belt should be used, and it should be adjusted to a slack state so that the handpiece is turning at its highest speed. The pulley wheels on the engine arm should be cleaned and lubricated at least once a week. By substituting ball bearing pulley wheels for the normal pulley wheels, the delivered RPM at the handpiece can be increased still further. All of these changes, however, were limited by the standard handpiece and contra-angle which were being used. Special cleaning and lubricating were necessary in order to prevent overheating and clogging of the handpiece or contra-angle. Also, there was a problem of bur vibration at higher speeds since the latch type contra-angles were not built to close tolerances. Improvement was noticed when the tapered shank bur type contra-angle was used. These adjustments and adaptations of standard speed equipment permitted the dentist to use the higher speeds of up to 20,000 RPM when he had a water spray attachment for his handpiece or contra-angle, or used his chair side assistant to direct a stream of water at the tooth and bur during cavity preparation. These changes were an improvement and permitted the more efficient use of carbide burs and diamond rotary instruments. Much of the work summarizing the early development of the higher speed handpieces and angles has been done by Ingraham and Tanner,[33] and Peyton.[66] Also, Ingraham and Tanner note that the successful use of modern instruments and increased operating speeds depends on the mastery of special technics and procedures which to some degree, change the present concepts of procedures in cavity preparation. They then present newly designed rotary instruments and technics for their use. With the problem of using inadequate standard equipment at higher speeds, the design of sleeve handpieces and contra-angles began to change. Normal handpieces had two revolving bearings, a shaft and a sheath with a film of oil between them to prevent excessive wearing and heat. Soon, the bearings were ground to closer tolerances to prevent heat and wearing. Then glass bearing surfaces were made, closely followed by ball bearing handpieces. In 1955, Peyton does not recommend speeds of above 20,000 or 30,000 RPM with the newer handpieces or angles of that time. At the same time, experimental studies at very high speeds were being conducted with the use of liquid and air driven turbine handpieces. In the same year, 1955, a belt driven handpiece was developed which utilized speeds of over 60,000 RPM.

All papers studied in this review of the literature emphasized that high speed was in a constant state of development. Writings and predictions were updated and outmoded almost upon publication. It is not expected that the present writer will have any greater success in evaluating a field of development which currently is so dynamic and evokes so much interest and controversy in the profession.

Although all speed classifications must be considered transitional at this time, for the purposes of this paper, only ultra high speed instruments and technics will be discussed:

1. Normal speed	2,000-10,000 RPM
2. High speed	10,000-30,000 RPM
3. Ultra speed	100,000 RPM and higher

Because of the fact that the ultra speed instruments have been newly developed, there is little to be found in the dental literature regarding them. Those papers which describe ultra high speed instruments or technics have no information regarding its special application to dentistry for children. The first paper describing an ultra high speed instrument appeared in 1956.[40] The use of this instrument has found favor in rapid, vibrationless cavity preparation and has been described by Kilpatrick,[37, 38, 39, 40] McEwen,[40, 51, 52, 53] Gordon[16] and Sarkin.[72] Peyton[64] has used the Page-Chayes handpiece in studies of tooth cutting efficiency.

The other instrument, at this writing, which reaches rotational speeds above 100,000 RPM is an air turbine contra-angle. This instrument provides vibrationless bur speeds in which no dental engine is utilized, merely a stream of air at pressures of 20 to 30 pounds. There are no references in the literature to this instrument. The clinical use of both the belt driven and the air driven ultra high speed handpieces in dentistry for children are described in another section of the paper.

Although the introduction of the basic team of water coolant with high or ultra speed rotary instruments seems dramatic and swift, the perspective of history has pointed out its gradual development with a sound scientific basis. Only the technical advance has speeded up so dramatically in the last five years. The scientific principles and concepts underlying this development have evolved during the past fifty years of dental history. It is the careful consideration in maintaining the fundamental principles of good restorative dentistry, to which all technics in this paper will be directed.

General Considerations in the Use of Ultra Speed

Ultra speed refers to the use of instruments which will deliver rotational speeds of over 100,000 RPM. The commercially available instruments which served as the basis for this study consisted of the belt driven angles and the air driven angles. Despite many differences which will be described in a later section of this paper, the general behavior of these two types is similar enough to consider them together for purposes of discussion. The following general considerations will hold true for all types and makes of ultra speed instruments.

1. Visual control. Good eyesight and clear visibility of the operative area is essential at all times. This is imperative, since there is almost a complete loss of the tactile sense which plays such an important role at normal or high speeds.

2. Thermal control-water coolant and water evacuation. If the flow of water spray is not copious and continuous at the site of drilling, the ultra speed instrument will produce great heat damage to the pulp. Suction or aspiration must be provided to remove the coolant from the mouth.

3. Digital control. This requires new digital skills with very light intermittent pressures. Necessary practice and instruction are required for the changes in operative technics.[2]

Visual Control

It must be emphasized that visual control of the cutting instrument is more important at 100,000 RPM than at 10,000 RPM. To understand the importance of this difference, the physical ac-

tion of the bur or stone must be considered in the vast spread of speeds in current usage, from 2,000 RPM to 200,000 RPM. At normal and high speeds which range from 2,000 RPM to 30,000 RPM, the rotating instrument is pushed against the tooth at pressures ranging to two pounds (32 ounces).[63] The bur cuts in the same manner as a carpenter's plane, each flute of the bur milling off a shaving of tooth.[82] At these speeds and heavy finger pressure, the bur flutes may "catch" the tooth structure, especially at angles or bulges of the tooth. This causes a "running" or "skipping" as the bur or diamond tends to skid out of control, spinning around the tooth in a dangerous manner. To control this possible accident, a technic of firm and steady finger support with muscular pressure is used to force the bur against the tooth. A counter pressure is ready at all times to control the bur if "catching" or "skipping" occurs. With these strong finger pressures, much work is done by tactile sense which is developed to a very high degree. Work is done by feel and tactile sense rather than by eyesight, so that visual control of cavity preparation or caries removal may be done at intervals. With the use of ultra speed instruments, tactile sense is diminished to the extent that visual control of the cutting instrument in contact with the tooth must be maintained constantly, at every stage of the operation.

The physical action of the bur or diamond at ultra high speeds abrades the tooth rather than mills it. The bur flutes revolve so rapidly that it feels as though a smooth, fluteless cylinder were being used to prepare the cavity.[82] At ultra high speeds, the sensation of drilling almost disappears and since there is no perception of vibration, the bur seems almost motionless. As the bur is gently placed against the tooth, the enamel or dentin seems to melt away or disintegrate. Since cutting is so rapid and easy with its accompanying loss of tactile sense, visual control of tooth preparation becomes essential. The operator must have a clear mental image of his preparation and must clearly see each placement of the bur or diamond because of the ease and rapidity of cutting. Accurate knowledge of pulp anatomy becomes increasingly important in the use of ultra speed instruments, since the "feel" or sensation of the bur going from enamel into dentin is almost completely lacking, particularly in the primary tooth. The operator must depend solely upon clear, accurate vision to shape the preparation and remove caries. If tactile sense or "feel" is relied upon at ultra high speeds, for caries removal, there is a possibility of unnecessary, accidental pulp exposures. If the dentist's natural or corrected visual acuity is less than normal, he should approach the use of ultra speed instruments with extreme caution.

To maintain good visual control at all times, the operator should wear prescription or clear glass lenses when using ultra speed instruments. The cutting instrument throws small particles of debris into the air which are likely to fly into the operator's eye with temporary loss of vision and possible damage or infection. Technics of using water coolant must be developed so they do not interfere with vision. Positions of patient, operator and instrument must be varied so that the operator is able to see the cutting instrument as it touches the tooth at all times. Under no circumstances should an attempt be made to operate with the use of tactile sense rather than visual control when operating with an ultra speed instrument.

Changes in technics must all be directed to this objective, so that the calibre of operative dentistry remains at its high level. Scientific principles of general room lighting and oral illumination must be utilized in the operating room at all times. Proper access and vision are of paramount importance in the use of ultra speed instruments in dentistry for children.

Thermal Control

Water coolant

Because of the large amount of heat which is produced, as demonstrated by many investigators[3, 21, 28, 42] it is inexcusable to operate any high speed or ultra speed handpiece without a water or water-air coolant directed at the bur and tooth. This basic rule may pose a serious problem to many men who have not used a coolant as part of their operative technic. Skills and technics are developed and improved upon with years of experience and it becomes increasingly difficult through the years to change to a different method of operation.

At normal speeds of from 2,000 RPM to 10,000 RPM, cavity preparation has traditionally been done on a dry tooth, isolated by cotton rolls or a rubber dam. Large portions of the preparation could be performed by tactile sense and the operator could "feel" when a slowly revolving round bur would clean out the carious areas and once again contact sound, hard dentin. From time to time the operator cleans the preparation with a blast of warm air for a visual inspection as the cavity preparation proceeds. These short periods of rest and inspection are also important in order to permit the tooth to cool down and to let the child rest for a few moments. Cavity preparation takes a considerable amount of time and the amount of work performed at each visit must be limited so that the child is not over tired.

With the use of ultra speed instruments in dentistry for children, the entire procedure of cavity preparation changes because of the use of a water coolant. The problem of working with a coolant may be almost insurmountable to some operators. It takes practice, perseverance and assiduous application to a technic which may take many months to perfect. It is unfair to expect that after operating at low speeds on dry teeth for many years, an operator can easily switch to ultra speeds with a Niagara of water spray blowing into the mouth, obliterating the mouth mirror and splashing into the operator's eyes. There are problems, each of which may be specifically overcome by thought and effort.

The most efficient method of cooling the tooth during ultra speed operations is to purchase a commercial apparatus which will direct a water or water-air stream at the tooth during cavity preparation. Several makes are available for the belt driven ultra speed instruments which function with the operation of the foot controller. In the air turbine handpiece, the coolant is controlled by a special foot control which automatically activates either a water or water-air coolant when the handpiece is in operation. One turbine handpiece directs two streams at the bur in an effort to provide enough coolant at ultra speeds. It must be emphasized that enough coolant be provided to actually blow or wash the grindings out of the cavity and to keep the blades of the bur washed clean. If the bur begins to clog or the debris of tooth grindings builds up within the cavity, it is a sign that

overheating is likely to occur. This may be caused by a. clogging of the water spray orifice, b. insufficient pressure to force the coolant into the cavity, c. excessive operating pressures or d. failure to use an intermittent touching technic while operating. If a heavy, steady grinding technic is used, no amount of coolant delivered by the handpiece will prevent damage to the pulp. To prevent rise of pulp temperature, it is important to use no more than two to six ounces of hand pressure and to use an intermittent touch with the bur touching the tooth for no longer than a one or two second interval, and then being removed for a moment. During this moment of removal, the bur should be kept within the cavity, not contacting the tooth, so that the water spray has the opportunity to further cool and cleanse the tooth of grindings and saliva. It is helpful if the spray is forceful enough to force the grindings and saliva out of the tooth to provide good vision, in a manner similar to heavy hose water pressure forcing mud and sand ahead of it in commercial drilling operations. The technic of grinding for only one or two seconds and then directing the coolant at the tooth during the short rest interval will be of great assistance in operating at ultra high speeds, particularly to prevent heat damage to the pulp and to provide good vision.

The obstacle of trying to work in a wet tooth while a water-air spray mingles with a copious flow of saliva may be both real and imagined. The first step is for the operator to realize that all who came before him overcame the same problems. At this writing, experience provides many of the answers to these problems.

1. The operator should provide as heavy a flow of water-air spray as possible, directed at the bur and cavity preparation. This provides better vision by forcefully blowing saliva and grindings out of the tooth and into the mouth where it may be evacuated.

2. The operator should attempt to focus his vision beyond the spray of water-air and focus directly on the tooth. This is similar to the idea of looking through a waterfall. By changing the focus of the eye only ¼ inch from the confusing mess of spray and saliva to the clear area just beyond it, vision will cease to be a problem.

3. The operator must wear protective eyeglasses to prevent saliva or grindings from being blown into his eyes, causing possible traumatic injury or infective processes to begin.

4. The operator should begin his attempts at working with a coolant on extracted teeth in order to adapt himself to some of these problems at his leisure. When beginning work in the mouth, it might be wise to start on mandibular teeth, so that it is possible to use direct vision.

5. When operating on the maxillary teeth there are several aids in obtaining better vision with the use of a coolant:

a. Tilt the patient back far enough so that the operator may work by direct vision. This, however, may create several other problems such as (1) the coolant accumulating back in the pharyngeal area, causing the child to choke or gag, (2) improper operating positions causing muscular or skeletal strains on the operator, or (3) the failure to force oneself to learn to operate in a normal position with a mouth mirror.

b. The mirror may be held in a position so that it is not directly beneath the tooth being prepared. This may be learned by the operator experimenting in holding the mouth mirror in different positions so that the water and grindings will not fall directly on the mirror.

c. From time to time, as the mirror tends to fog up or accumulate vision obstructing

debris, the water spray from the handpiece should be directed at the mirror in a circular washing motion to clean it. The rest interval of a second or two, as learned in the intermittent grinding technic, may be used to advantage in directing the spray at the mouth mirror. These are practical aids which must be carefully learned in the beginning, but which will become automatic with experience.

d. The mouth mirror may be dipped into a detergent wetting agent to reduce the surface tension and permit the grindings to wash easily off the mirror.

e. A mouth mirror has been devised which is self-cleansing by virtue of an air current spinning the mirror as a turbine and by the action of the mirror spinning off the water and debris.

Water evacuation

The introduction of large amounts of water-air spray coolant provides the corollary problem of properly evacuating the fluid and saliva during operation. Evacuation should be rapid and thorough to prevent a build-up of the fluid which may frighten or choke the child, and also to prevent flooding and flowing over the lips which is sloppy and may obstruct the operator's vision. If evacuation is rapid, there is generally no need for the child to rinse the mouth or to take rest periods, since cavity preparation with ultra speed instruments proceeds and is completed so rapidly.

Three methods of coolant evacuation may be used successfully. (1) The saliva ejector should be clean and operate effectively in order to remove fluid in enough volume before it fills the mouth. This may be tested by running the water coolant into a full cup of water while the saliva ejector is operating. If the water flows over the top of the cup, the saliva ejector should be cleaned and adjusted until it removes water as fast as the handpiece will deliver the coolant. If removal is inadequate, (2) the pump aspirator may be used. When using the pump aspirator, the dental assistant may hold a straight suction tip near the site of operation, or a saliva ejector tip may rest in the floor of the mouth. The weight of the heavy tubing may cause the saliva ejector to press into the sublingual tissues and cause great discomfort to the child. It is also important to prevent the greater suction of the pump aspirator from drawing fragile soft tissue into the holes or slots of the saliva ejector. Therefore, when the pump aspirator is used for water evacuation, it is recommended that the dental assistant use a straight aspirator tip and take care that it does not impinge or injure the child's soft tissue. Another type of evacuation may be the most efficient for children's dentistry. (3) This is called a high speed vacuum or the washed field technic.[55, 81] A number of commercial high vacuum units are available in mobile cabinets or attached to the operatory wall or dental unit. Wide mouthed aspirator tips are available which must be manipulated by the dental assistant at the chair. This type of tip removes fluid quickly and efficiently without impinging or sucking soft tissue into the tip. It has the further advantage of drawing fluid from a considerable distance from the orifice so that the tip may be held slightly away from the immediate operative area so that there will be no impairment of the operator's vision. If the large evacuation tip is held too close to the tooth, the coolant is evacuated by force so rapidly that it doesn't have a chance to cool the tooth properly. The tip should be held far enough away from the tooth to permit the coolant to thoroughly saturate the tooth and cool it to prevent heat damage to the pulp.[64] A minimum of 1.5 cc. water per minute should be used to cool the tooth to proper phys-

iological levels. Particularly, when the high vacuum technic is used, greater volumes of water should be delivered to the tooth, up to 8.5 cc. per minute, or as great a volume as can be used without impairing the operator's vision. If a large volume of water is used, there are multi-hole quadrant isolators available which are self retained by clamps or springs. This provides a large, fast flow of coolant across the tooth, providing unexcelled access and vision. One type of quadrant isolator is an aid in dentistry for children since it blocks the tongue away from the area of operation. The retaining spring also helps to keep the tired mouth open in a manner similar to a bite block. The washed field technic of operating also is effective since it aids in vision by keeping the mouth mirror free of debris.

Peyton[64] has done very informative tests which indicate that adequate cooling may be obtained with either a copious water stream or a water-air spray. Cooling is effective whether room temperature or mouth temperature water is delivered to the tooth. Although there is a greater rise in temperature if the coolant is evacuated quickly with a high speed vacuum, the rise is clinically insignificant, particularly with a light, intermittent grinding technic. It must be remembered that for many years, hand pressure of two pounds (32 ounces) was commonly used at speeds of 2,000 to 5,000 RPM. Temperature rises of 50°-60°F. can be produced even at speeds of 2,000 RPM. It is clear that the temperature rises of 10°-12°F. are much less dangerous with ultra speeds of over 100,000 RPM as long as light pressures of two to six ounces with intermittent grinding and large amounts of coolant are used at all times. At ANY speed, it seems inadvisable to operate in a dry field without a coolant. Certainly, at speeds of 100,000 RPM and above, copious coolant is essential. In dentistry for children it is even more important with large pulps and young teeth, so that no possibility of overheating be permitted in any technic which may be advocated.

In résumé, it cannot be stressed too strongly that in the use of ultra speed procedures, the following rules should be observed, for proper thermal control:

1. Copious water stream or water-air spray coolant should be used. Air alone is inadequate.
2. Adequate evacuation of the coolant, giving it sufficient time to saturate and cool the tooth.
3. Use clean, unclogged diamond or carbide cutting tools of the smallest size which will do the job.
4. Perforations or coolant holes in larger diamond instruments to permit the coolant to contact the tooth.
5. Light operating pressures of two to a maximum of six ounces.
6. Intermittent grinding of a maximum two seconds with interval moments of directing the water spray at the tooth.
7. Discard dull instruments since they may still give satisfactory performance beyond their optimum performance time, although large amounts of unnecessary heat will be generated.
8. Do not permit the smooth shaft of the cutting instrument to rest against any portion of the tooth during cavity preparation, since it will produce great frictional heat.

Without careful and adequate thermal control as outlined, ultra speed instruments should not be used. The greatest danger in the adaptation of ultra speed technics to dentistry for children is the possible damage and abuse to the pulp which will occur as a result of heat damage. All of the above 8 rules will assist the operator in maintaining proper physiological tooth temperature even at speeds above 200,000 RPM.

Digital Control

At ultra high speeds, new skills and technics must be perfected so that operative procedures may proceed with precision, dexterity and smoothness. It is not enough that the operator produces an excellent end result. It is also the manner and efficiency of operating which measures the art of operating skill. Particularly in dentistry for children, gentleness of tissue manipulation and painless speed of completion are important factors in judging the physiologic success of any operative procedure. Careful attention to detail is needed to change from heavy hand pressures and "one tooth at a time" dentistry to the very light finger pressures and multiple restoration quadrant dentistry which is made possible by the use of ultra speed instruments.

In order to help the dentist who is first beginning the use of ultra high speed procedures, he may gain some idea of light finger pressures by practicing with a tooth mounted on a small postal scale. It is some aid to know that with most presently available types of air turbine instruments, the use of too heavy pressure will automatically stop the cutting tool. However, with the use of the belt driven ultra speed instrument, it is possible to use excessive pressure which may be causing heat damage to the pulp. Pressures of from two to a maximum of six ounces should be used with the ultra speed instruments. This takes careful attention to detail and practice of the proper pressure, especially when it is realized that two pounds (32 ounces) of pressure are normally used at standard operating speeds. Instead of pushing the instrument with pressure against the tooth, the fingers must gently and accurately place the instrument and permit the cutting tool to do the work. Rigid finger pressure must be used to keep the lips or tongue away from the desired area. The ultra speed bur cuts so rapidly that accuracy and care become more important than with conventional instruments. A slip may mean a pulp exposure or lacerated soft tissue. When anesthesia is not used, there may be an involuntary muscle tightening of the cheek or lip which may push the instrument out of its desired position. Finger rests should be accurate and firm to prevent the bur from being pushed against the tooth. When conventional instruments are used, strong finger rests are used to press the cutting bur against the tooth and prevent slippage or "running" of the bur. The purpose of the finger rest in the use of ultra speed instruments is to prevent the bur from being pushed out of control by the child's cheek, lip or biting down on the instrument. This is no condemnation of the instrument, but rather a warning that better dentistry is necessary and possible when the instrument is properly used. A sharp scalpel will cause more damage than a dull one if it slips, but we do not operate on the premise of slips and errors. Operations on both hard and soft tisssues should be performed accurately, carefully and with respect for the biological principles involved. With ultra speed instruments in a properly lubricated field, it is possible to cut quickly, accurately and with a minimum production of heat and trauma, if reasonable skill and care are observed.

Small cutting carbide or diamond tools are used in dentistry for children, so that conventional disc guards are not necessary at ultra speeds. The mouth mirror, cotton roll holders (lingually) or tongue and cheek retractors may be

used to prevent accidental laceration. For the pre-school child, it is recommended that a rubber bite block be used to maintain separation of the jaws. This precaution is recommended since the ultra high speed cuts so rapidly, that if the child inadvertently bites down on the contra-angle, it will almost surely penetrate the pulp. This is less likely to happen with the air turbine type of instrument since excessive pressure against the tooth will stop the instrument.

Proper digital control in the use of ultra speed instruments also requires the use of an intermittent cutting technic which has been described, in addition to light operating pressures. Constant, small finger movements are used to swing the tip of the cutting bur in an arc rather than pressing the bur straight down or sideways. This point of technic is very important in producing effortless, swift cutting. It is used with an intermittent cutting action whereby the bur cuts at both ends of the small pendulum swing, for only a one or two second contact with the tooth. Between contacts with the tooth, while maintaining the same finger rest positions, the bur is lifted only slightly away from the tooth so that the water spray is directed squarely at the areas which were just cut, in order to cool the area and to blow away the debris of grinding. These points of intermittent cutting and constant moving of the bur to prevent heat build-up hold true in all ultra speed procedures. The only time that there may be a justifiable criticism that ultra speeds will cause pulp damage[44,73] is if an operator does not use the copious water spray as recommended or if he uses too much pressure and holds the bur against the tooth for longer than the one or two second grinding interval as recommended.

Operative Technics

Certain procedures and precautions have proven to be of great value in the use of ultra high speed instruments for children. If the child has had previous operative dentistry performed in the conventional manner, he should be given a simple explanation of the new method so that he will not be surprised at the new procedures. A few words will suffice to mention that something new will be used to spray water on the tooth to keep it cool and make everything easier; also that the tooth will be touched very gently and there may be a little high noise which sounds like a "jet." If these simple precautionary explanations are not given to the child, the unexpected whining noise or sudden water spray may be very frightening and cause an involuntary movement with accidental cutting of tooth structure or tissue laceration. The term "high speed" should be avoided in any explanation, since it may conjure up a mental image of a rapidly turning drill which may be frightening.

Assuming that good vision and access, thermal and digital control are obtained, cavity preparation with ultra high speed instruments may now be considered. Without good vision and access, it is impossible to produce good dentistry with an ultra high speed instrument. Since the tactile sense built up over many years experience with conventional instruments is of little value, the ultra high speed bur has to be seen to know where it is cutting and how much tissue is being removed. The sense of feel in dentin and caries which helps direct the bur in conventional cavity

preparation, is of no value with ultra high speed. The longer a dentist has operated with conventional speeds, the more difficult it will be for him to change his technic to that of ultra high speed dentistry. However, if he is fully aware of the problems to be expected, as outlined in this paper, and makes an effort to overcome them, he will be rewarded with a technic of cavity preparation which will provide good, swift dentistry for the child, and ease and comfort of operation for the dentist.

The instrumentation of ultra high speeds in dentistry for children may be varied from standard procedures. As a suggestion, the following basic technics may serve as a practical guide to those whose experience in this field may be limited. One or two diamond stones or carbide burs of the smallest possible sizes will suffice for most preparations. There is no longer a need for the complex variety of shapes and sizes which were necessary at conventional speeds. The best clinical technics must be tested and evaluated at the ultra high speeds before any detailed instrumentation can be fully recommended. When using diamond stones at ultra high speeds, each stone should be tested in the handpiece before it is used, to make sure that it is centric and runs true. McEwen[53] states that he has found coarser grit diamonds with wider distribution of particles to be more effective at ultra high speeds. McEwen also states that added care is needed when preparing primary teeth, since they are softer and may be cut too rapidly. Diamond wheels should not be larger than 5 mm. at ultra high speeds or a whipping action which tends to dislodge the cutting tool from the handpiece is likely to occur.

When using carbide burs, the operator should first purchase only a small selection of sizes and have as many different brands as possible. The design of size and spacing of bur flutes affect the ease and rapidity of cutting. The spacing and number of rows of blades also affect the amount of heat which is generated and the dispersion of tooth grindings to prevent clogging of the bur. The writer hesitates to recommend the brands which he has found to be most effective, since the manufacturers are constantly changing their design to produce the best possible results. All of the following methods of tooth preparation have been designed to use the smallest number of burs and diamonds possible.

Class 1 and 2 preparations.

A No. 557 cross cut fissure bur may be used to prepare the entire cavity, except for removal of caries. The occlusal form may be established by reducing small layers of enamel over the entire outline in an oscillating or pendulum movement of the bur, gradually lowering the bur into the cavity until the desired depth is established. The removal of caries may be done with the belt driven handpiece and a No. 6 round bur operated at the slowest speed. With experience and care, the operator will feel when the hard, sound dentin is reached, and the soft caries removed. This assumes that the bur must run below 30,000 RPM to get tactile sense. At ultra high speeds with the air driven or belt driven handpiece, caries may be removed by vision, only if the caries is brown or black. The instrument, at these speeds, does not permit the operator to feel when the caries is gone and sound dentin reached, particularly in primary teeth. Once the cavity form is

completed and the visible caries removed with ultra high speed, the use of hard steel, sharp hand excavators is the fastest, least dangerous method of removing the remaining caries until sound dentin has been reached. In this writer's experience of 2½ years, it has not been necessary to switch back to the use of the conventional handpiece for any operative procedure. However, if an operator desires to complete caries removal with the engine, a No. 6 or 8 round bur should be used in the conventional contra-angle at lowest speed with the lightest possible pressure. After the caries is removed, final smoothing of cavity walls may be done with a plain fissure bur or fine carborundum finishing stone in the ultra high speed instrument. Hand instrument smoothing and finishing may be done if desired, although evidence by Street[75] indicates that chisels and hatchets leave rough and scratched cavity margins.

In class 2 preparation, after the occlusal portion has been prepared, the entire proximal box may be completed by moving the bur bucco-lingually just inside the marginal ridge. The gingival depth is established by gradual "stepping down" of the bur. With this method, the outer wall of enamel will "flake" away without actually being drilled and there will be no danger of accidentally abrading the contact tooth. Another method of preparing the proximal box is to start the bur either on the buccal or lingual wall and carry it directly into the proximal box at the correct gingival depth. This may be easily done with an ultra speed instrument, since the carbide bur cuts quickly into the surface enamel without any "skipping" or "jumping" of the bur. The preparation may be varied for amalgam or inlay merely by angling the bur. The entire cavity preparation must be visualized if a technic using just a No. 557 or 701 bur is to be used, especially in accurately judging occlusal and proximal depth. If these distances cannot be judged accurately, it may be well to use a No. 37 inverted cone bur to shape the occlusal and establish the depth of the occlusal floor. Care must be taken not to permit the smooth shaft of the inverted cone bur to touch the tooth when the cutting end is inside the tooth, since a large amount of dangerous heat will be generated. The smooth shaft must not be permitted to touch any soft tissue at ultra high speeds, since it will strip and abrade the mucous membrane.

A class 2 preparation without deep caries may be prepared in less than a minute when the operator is completely familiar with the instrument. Much shorter operating times are possible, but not recommended. While it may seem almost unbelievable to state that a good class 2 preparation may be completed in 15 to 30 seconds, the cutting ability of the ultra high speed instruments should be kept in mind. Peyton[63] has measured the effectiveness of tissue removal at ultra high speeds of carbide burs. It is interesting to note that at 150,000 RPM with a 4 ounce load, approximately 300 mgm. of tooth tissue would be removed in two minutes. The entire crown of an upper central permanent incisor or a primary molar may weigh about 500 mgm. It can readily be seen that almost the entire crown can be removed with two minutes of grinding at ultra high speeds. With a load of 6 ounces and even higher rotational speeds, proportionately more tooth tissue would be removed in the same amount of time. These figures, as related to the relatively small amount

of tooth structure which is removed during cavity preparation, give a startling, clear picture of the short time which may be required to complete a class 1 or class 2 cavity.

If the operator has an accurate mental image of the desired tooth preparation, he may place the ultra speed instrument carefully and remove tooth structure with a minimum of heat, pressure or vibration. The fact is that the use of ultra high speeds should make cavity preparation easier, more accurate and faster for the majority of operators. Just how fast the cavity may be prepared is up to the skill acquired by the individual dentist. The objective, it must be flatly stated again, is not speed, but good, sound dental procedure.

Class 3 preparations.

The No. 1 or 2 round bur at ultra high speeds is used to penetrate the enamel and complete the cavity preparation in one operation. Care must be taken that too much cutting is not done since the preparation goes so rapidly. With thin enamel walls care must be taken that the bur does not chip or "flake" away the enamel at the incisal corner. Caries removal is accomplished as in class 1 and class 2 preparations.

Class 4 preparations.

A No. 557 or 701 bur may be used first to establish the proximal wall and then to complete the remainder of the preparations. If desired, the proximal wall may be established with a 5/8 inch diamond disc at about 30,000 to 60,000 RPM in the belt driven handpiece. If the air turbine is used, the operator may change to the conventional angle at high speeds to use the 5/8 inch disc for the proximal wall. A small fine carborundum finishing stone may be used at ultra high speeds to smooth the preparation. Caries removal is accomplished as described previously.

Class 5 preparations.

A No. 557 bur is used to prepare the entire outline and establish the desired depth. Caries removal is accomplished as before.

Crown preparations.

The preparation of a primary tooth for adaptation of a stainless steel crown may be accomplished with a single cutting instrument, either a flame shaped diamond or a No. 701 tapered fissure bur. With either instrument, the occlusal height is reduced first and then the enamel walls are reduced to below the gingiva by carrying the instrument around the entire circumference of the tooth. If the carbide bur is used, it must be followed by a fine carborundum stone to smooth the entire preparation.

For full or three-quarter crowns, a small diamond wheel may be used to reduce the occlusal, lingual or buccal enamel. A 5 mm. wheel is effective at ultra high speeds and a larger wheel should be avoided since it will produce more heat. With the belt driven handpiece, a $\frac{5}{8}$ inch outside cutting perforated disc may be used at first rheostat speed to make proximal cuts. At ultra high speeds either with the air driven or belt driven instruments, the proximal cuts are made with a No. 557 or 701 fissure bur. Narrow diamond tapered cylinders or extra long tapered fissure burs are used to prepare the entire crown. The walls are reduced step by step down to the desired gingival height. Since there is no "running" or "catching" of the bur as it is run around the circumference of the tooth, the entire crown may be prepared with this one cutting

tool, even to the extent of creating a subgingival shoulder, if desired. If the gingival finish is to be a feather edge or chamfer, a narrow flame shape diamond is used. The writer has found that at ultra high speeds, the carbide bur acts as efficiently as diamonds in cutting enamel or dentin for crown preparation. The carbide bur, however, leaves marks and imprints of its blades on the tooth, so that final finishing with a carborundum stone is necessary to smooth the preparation.

Jacket or veneer preparations.

To prepare a broken incisor for a temporary protective acrylic crown, a small cup shaped diamond may be used to reduce the incisal height and to slightly reduce the mesial and distal labial bulge, so that there will be enough interproximal space to construct a shoulderless crown. A tapered diamond cylinder may be used for the same purpose. No further preparation should be attempted because of possible pulp damage to the injured tooth.

For a typical porcelain jacket preparation, the incisal length is first reduced with a No. 557 or 701 fissure bur. Then, mesial and distal cuts are made to beneath the gingival crest with the same bur. The labial and lingual bulk is reduced in steps, downward from the incisal so that the depth and width of the shoulder is controlled. The shoulder can be completed beneath the crest of the gingiva with the same instrument. The preparation is then smoothed with a fine carborundum stone. Other instruments, such as tapered diamonds or small diamond wheels may be used to advantage in a preparation of this type, according to the technic which is comfortable for the individual operator. At first rheostat speed with the belt driven handpiece the operator may wish to use a 5/8 inch disc to establish the proximal cuts. Basically, however, when developing new operating habits with ultra high speed, an effort should be made to use the least possible number of cutting instruments which will give the desired result. In all procedures at ultra high speeds the smallest cutting instrument should be used which will be effective for the purpose.

The Belt Driven Handpieces

In 1955, Page developed an ultra speed handpiece which has been described in detail by Kilpatrick,[37, 38, 39, 40] McEwen,[51, 52, 53] Gordon[16] and Sarkin.[72] This instrument operates off the dental engine and belt with the use of the foot rheostat to control speeds. It develops its ultra speed by means of an internal belt and pulleys within the body of the handpiece which gives a mechanical five to one ratio. For the handpiece to develop proper speed, it is necessary to have speeds of over 20,000 RPM coming off the engine belt. This can be accomplished on older units by mechanical and electrical changes as described in the review of the literature. The new dental units reach adequate speeds without any changes or modifications. The handpiece may be supplied with a dual arm and transmission which permits the operator to use the standard handpiece or the ultra speed handpiece, since both are instantly available at the engine arm. If this is not desired, the operator may detach the ultra speed instrument from the engine arm and substitute the standard handpiece in just a few seconds. The importance of having both the ultra speed and conventional handpiece instantly available has been overemphasized, in this writer's opinion, since all portions of both intra-coronal

and extra-coronal preparations may be completed with the ultra speed belt driven handpiece. The only problem which presents itself is the removal of caries, and this may be done with sharp spoon excavators, or with the belt driven ultra speed instrument operated at the first speed of the rheostat, using a large round bur.

In the writer's experience, it has not been necessary to return to the conventional handpiece for restorative dentistry in a single instance. With the continued study and development of new operative technics with the ultra speed instruments, the days of high finger pressure and low cutting speeds will soon be over. Only when turning to procedures as prophylaxis, or adjustments and polishing of prosthetic appliances, is it necessary to turn back to the conventional handpiece.

This handpiece, known as the Page-Chayes handpiece, uses a small rubber bushing set in a metal meshwork to hold the diamond and bur cutting tools in place by friction. This handpiece carries an air line which forces air out from around the bur tube head to prevent debris and spray from entering the inner portion of the handpiece. The handpiece also carries built-in tubing for the water spray which is directed at the cutting instrument. The length of the head of the handpiece is 1.50 cm. With a standard 557 SSW bur, the length of the head is 2.37 cm. With a friction grip bur cut short, so as to resemble a short shank bur, the total length of the head is 2.0 cm. These comparative figures are given for all ultra speed instruments which will be described, since in dentistry for children, a large or bulky angle head will certainly hinder operating in small mouths, especially in doing gingival preparations in the posterior teeth.

In using this ultra speed instrument, it is extremely important for the operator to use light pressure since excessive pressure will cut the tooth too rapidly, causing heat damage or accidental pulp exposures. Another danger is tissue abrasion from a possible sharp edge of the rubber impregnated wire mesh chuck. Other problems which may arise with the Page-Chayes handpiece include the possibility of using a chuck which does not hold the bur or diamond in centric. To test and avoid this problem, insert a bur in the new chuck and run the engine at its slowest speed, holding a fingernail against the smooth shaft of the bur. If the bur is not running true, a bumping action will be noticed as the bur spins eccentrically. The chuck should then be discarded and a new one tried until the bur runs exactly true. If an eccentric chuck is inadvertently used, or if a chuck is used after it has become worn, the bur may appear to run accurately at ultra high speeds, since at these speeds the slight eccentricity is imperceptible both to sight and to feel. However, a small round bur running out of true centric may cut a cavity twice as large as the operator intends, since the end of a bur runs in a small arc, thus making accurate cavity preparation impossible. A 557 bur running out of true centric may destroy more tooth structure than desired and actually knock off thin enamel walls or margins.

Another problem which may arise is that of the bur gradually slipping out of the chuck during operation. This occurs if too much lubricant is used when inserting the bur into the chuck, if the chuck has been used too long and is beginning to wear, or if the handpiece is pulled away from the tooth while the bur is cutting tooth structure. The tech-

nic of operation should consist of small arc-like to and fro intermittent movements of the bur against the tooth when cutting. This movement and technic of cutting will tend to seat the bur more securely in the chuck and slippage will not occur. It is only when the conventional method of placing the bur in the cavity and drawing it laterally and occlusally to undermine and chip off the enamel is used, that slippage tends to occur. It must be repeated that a new technic of handling the instrument must be learned. If the bur slips out of the chuck at 100,000 RPM the tip of the bur tends to circumscribe a wider and wider arc with the possible danger of cutting soft tissue. This whipping action may occur as the bur slips out of the chuck, but once the bur comes completely out of the chuck it loses speed so fast that it falls harmlessly to the floor of the mouth without injuring tissue. McEwen has experimentally loosened burs operating at ultra high speeds in the mouth and has found that they always lose torque and the ability to do any harm before they hit tissue. There may always be the possibility, however, that a loose bur may be swallowed, so that it is wise to observe all precautions and use a method of operation so that bur slippage will not occur.

Bur breakage may occur with this handpiece in the simple removal of the bur from the rubber chuck. If enough lubricant is not used in inserting the bur, it may tend to stick in the chuck, and break off when removal is attempted. A plastic tong is supplied with the instrument for the removal of the bur. The bur must be pulled directly outward with slow, steady pressure to avoid unnecessary breakage and expense. The writer has found it to be of great help to adapt a small pair of end cutting pliers to grip the shank of the bur for removal from the chuck.

A second type of belt driven ultra speed handpiece which is presently available, is the Kerr Superspeed Handpiece. This instrument was introduced approximately two years ago, and in gross physical appearance closely resembles the Page-Chayes instrument. The Kerr handpiece is so similar to the Page-Chayes handpiece that the technic of using the instrument is identical. The major points of difference follow: 1. the chuck which retains the bur is made of metal and provides more secure retention of the bur during operation; 2. there is no need to frequently replace the chuck, which is the "shock absorber" in the Page-Chayes handpiece between the bur and the bearing. Because of this fact, it may be necessary in the Kerr handpiece to expect more frequent repairs. This expense may be offset, however, by the fact that frequent rubber chuck changes in the Page-Chayes instrument may run to a considerable yearly expense. The choice remains a personal one since the advantages or disadvantages of one over the other seem to be very slight in actual clinical usage. Both perform excellently.

Another point of difference is that the Kerr handpiece does not use any air or oil mist through the handpiece during operation. This may permit some saliva or water spray to enter the instrument with possible future damage. To offset this problem, it is recommended that the handpiece be placed in a dehydrating jar overnight, and possibly between patients, to absorb any moisture which may have lodged in the instrument. In addition, the cutting burs and diamonds are made with a collar to prevent the moisture from entering the instrument during operation. This collar may present a minor problem if the

handpiece is improperly held so that the free shaft of the cutting instrument touches soft tissue. In this case, the collar would tend to abrade the soft tissue and strip the epithelium. The only precaution necessary would be to develop a technic in the use of all ultra speed instruments which would not permit the shaft of the cutting instrument to touch any soft tissue.

The shape of the handpiece as compared with the Page-Chayes may cause the operator to prefer one over the other, since the Page-Chayes is more of a right angle handpiece, and the Kerr Superspeed tends to resemble the traditional contra-angle type. This becomes a personal choice after direct comparison of the two instruments, since both are equally effective in the mouth. The length of the angle head is identical to that of the Page-Chayes head, i.e., 1.50 cm. with a bur. However, because of the collar on the bur, the length of the head with the bur inserted is 2.56 cm. It is also impossible to shorten the shaft of the bur to give a short shank effect, so that this may be a factor to consider in the use of this instrument for dentistry for children. Since the instrument is rheostat controlled, the speed is variable enough to permit the use of round burs at low speed for caries removal. There is no vibration of the bur at lowest speed, which is somewhat of a problem at low speed in the Page-Chayes instrument which has a flexible chuck. The bur may be instantly and easily changed by placing an instrument or fingernail under the collar of the cutting instrument and dislodging it from the metal chuck. The instrument may be changed with a conventional handpiece on the engine arm in a few seconds, or a dual arm set-up may be used if desired.

Burs should not be used in any of the ultra speed instruments after they are worn or dull, since they will generate unnecessary amounts of dangerout heat. They may seem to continue to cut in an efficient manner, but if a new bur is inserted, it will be quickly seen how much better it is. With the belt driven ultra speed instrument it is also possible to use perforated discs and wheels, if desired, because of the rheostat controlled operating speeds below the ultra speed range. The operator should not attempt to use large wheels or discs at ultra high speeds, since the peripheral speed of the disc becomes too great, causing a whipping and spinning of the cutting tool out of the chuck. If the rheostat is used at first or second operating speeds, however, diamond discs may be used for proximal or occlusal slices. The writer finds no need for the use of these large cutting tools in dentistry for children, since slices can be accurately and easily made with small diamonds or with a 701 fissure bur, with no possible danger of disc slippage or cutting.

The Air Turbine Handpieces

The air turbine type of handpiece utilizes compressed air as the motive power of the bur, rather than any belt or gear driven mechanism. Air pressure from 10 to 30 lbs. per sq. inch is blown against the blades of a small air turbine which is located in the head of the contra-angle. Rotary speeds of 100,000 RPM to 250,000 RPM are developed by the bur according to the amount of air pressure which is delivered. In most office installations it will be necessary to use an air compressor which has a large capacity designed for air turbine operation. The size of this additional compressor depends on the number of air turbine installations in the office and will be recommended by the manufac-

turer. The amount of air which is delivered to the handpiece is controlled by a rotating knob on the control box, thus making instantaneous variable speeds almost impossible. In operation, the dentist sets the control to a speed which is suitable for him and merely uses the foot switch for starting and stopping the instrument.

The control unit of the air driven handpiece also contains an oil supply with control to add oil lubrication to the compressed air before it reaches the air turbine. This oil mist provides adequate lubrication for the handpiece bearings. When using the air turbine for the first time each day, insert a bur into the chuck and hold it firmly while starting the handpiece and adjusting the amount of lubricant to be added. This precaution is taken to provide sufficient lubrication initially and also to make sure that not too much oil is added to the air. If too much oil is added with some air turbine handpieces it may possibly accumulate on the mouth mirror and interfere with the operator's vision. With at least two makes of air turbine, the lubricant mist is not vented into the mouth through the air ports at the operating head, but is directed back through the handpiece and is vented out of the mouth after passing through an absorbent filter. A separate air line is used in this type of instrument to provide oil free air supply for the tooth coolant spray.

The air turbine handpiece does not attach to the engine arm so that it may be attached either to the dental unit or separately as desired. It is much lighter in weight than the conventional or belt driven ultra high speed instruments with their accompanying engine arm and belt. Because of only one light hose connection, the air turbine handpiece is easy to handle and very maneuverable. If the operator wishes, either the conventional contra-angle or sharp spoon excavators may be used for caries removal. At ultra high speeds it is not recommended that the air turbine handpiece be used for final caries removal since tactile sense is almost completely gone. When using the air turbine handpiece, the conventional contra-angle is instantly available on the unit for any portion of the operation which requires slower speeds, such as caries removal with a large round bur, prophylaxis or adjustments and polishing of prosthetic appliances.

The diamond and bur cutting tools are held in place by friction of a plastic chuck which is seated in the angle head. The bur is pressed into position and is easily removed when desired by pressing it out of the chuck with a small instrument which fits into the back of the angle head. The length of the head of various handpieces ranged from a minimum of 1.46 cm. to 1.55 cm. All heads were comfortable in size for easy use in the child's mouth. With a standard No. 557 SSW bur, the handpieces ranged from 2.18 cm. to 2.29 cm. at the head. If desired, the bur may be shortened to resemble a short shank bur and the total length then varies from 1.91 cm. to 2.05 cm. Bur breakage is less likely to occur in removing burs from the air turbine handpiece than from the Page-Chayes instrument. It is equally important, however, to use centric true running cutting instruments in both the air driven and belt driven type of ultra high speed handpiece.

The air turbine handpiece is operated by a foot switch which also activates the built-in coolant during the operating period. With some instruments, the foot switch is attached to the motor

rheostat for convenient operation, and in others a separate foot switch is used. It is important to permit the bur to develop its full speed before placing it against the tooth structure so that its cutting power will be at its best. The instrument is designed to be used with very light finger pressure of two to four ounces. A wiping action of the bur is used with intermittent drilling so that the bur maintains its speed. If the bur is placed against the tooth with excessive pressure it will either slow down or stop completely. This is a safety factor which will prevent some operators from using too much pressure and therefore causing heat damage to the pulp. This same factor of low torque will also prevent some accidental pulp exposures which might occur with a belt driven ultra high speed instrument. If the bur is accidentally pushed against the tooth either by involuntary closing of the mouth or muscle pressure, the air turbine will stop immediately. Also, if the bur catches against soft tissue, it will stop and thus prevent tissue laceration.

This factor of torque varies from one make of air turbine handpiece to another, and the operator should select one which is to his liking after trying them all on extracted teeth. Low torque may be a hindrance in the use of this instrument since it will not cut as rapidly as the belt driven type of handpiece. In the removal of metal fillings, inlays or crowns where greater bur pressure with more torque may be desirable, the air turbine proves to cut more slowly than the belt driven instrument. However, it must be up to the individual dentist's own preference which type of action is best for him. The safety factor of automatic stopping or braking under excessive pressure may be more important in dentistry for children. Air turbines which give excellent results are made by S. S. White, Ritter, Weber, Midwest, Star and Densco manufacturing companies. The dentist must see and compare them before making his personal selection.

Summary

The development of rotary instruments over the past fifty years has shown a gradual shift to higher rotational speeds with light, intermittent operating pressures in conjunction with the use of water lubrication. With the introduction of efficient diamond and carbide cutting instruments, handpieces were developed which produced ultra high speeds in excess of 100,000 RPM. The acceptance of these new instruments calls for an evaluation of changes which are necessary in operative technic.

Clinical experience in dentistry for children has indicated that ultra high speed permits faster and easier tooth preparation while maintaining high standards of fundamental concepts and principles. Many changes in standard operating procedures are required to produce the desired results. New concepts of cavity preparation will develop with the acceleration and delicacy of tooth cutting at ultra high speeds. The field of ultra high speeds is in a state of dynamic clinical investigation. Methods have been suggested in this paper which will aid the dentist whose experience in this field is limited. The operative technics and employment of ultra high speeds as described, have given excellent clinical results. The choice of instrument may vary the technic somewhat, but the basic principles of visual control, thermal control and light, intermittent operating pressures hold true with any technic. The use of ultra high speed technic in dentistry for children is recommended as a step forward in the

improvement of operative procedures. Further experience and research are necessary in order to fully evaluate and recommend detailed technics which may be acceptable in ultra high speed procedures.

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American Society of Dentistry for Children

Unit News

GREAT. Just great. That's about the only way to describe your responses to my pleas for news. This quarter, 21 Units and two sections are reporting, and, like I said, that's great.

There's no point in dilly-dallying around so let's see what our confreres are doing.

Arkansas

R. L. Smith reports for his Unit. His article is so good, here it is *in toto*.

Another important yearly highlight of the Arkansas Unit was its seminar meeting held in conjunction with the Arkansas State Dental Seminar, September 29. The meeting was held in the Willow Room near fabulous Velda Rose Motel in Hot Springs National Park, Arkansas. One of our own members was our clinician for the day. Dr. Maurice J. Friedman, in his own inimitable way, presented the "Community Health Programs: Past, Present, and Future."

Our Unit was cited for its splendid cooperation in all these programs. ASDC has taken the lead in many of these and especially is this true with the annual observance of National Children's Dental Health Week. In nearly every district and on the state level an ASDC member has chairmanned this special week. The year 1959's observance of NCDHW has already been planned with R. C. Malcolm as its Chairman. With the active support of the ASDC, we are expecting this week to be the greatest ever.

Our planning in past years has been excellent. This is evident from the fact that one of our "pet projects" has gained nationwide interest. This project was the use of bill-boards to acclaim this week. This year the American Dental Association has adopted this means of publicity and these bill-board posters can now be obtained from the ADA.

Presented to the group also was the *Dental Health Consultant's Guide*. This very excellent publication is the result of much hard work at the Petit Jean Dental Health Conference, an outstanding program of the Arkansas State Dental Association. This year's Biennial Petit Jean Conference is well into the planning stages under the able direction of Dr. Durward Collier, Director of the Dental Division, Arkansas State Department of Health. ASDC plans to cooperate fully in this program.

Northern California

The two California Units must have a contest going to see which one can send in the most copy. Claude Warden represented the "Yankee" element this time and really did a fine job.

The summer, he wrote, saw most of our members pursue one or more of their so-called favorite pastimes. Our Unit's claim to activity worthy of reporting will have to resolve itself into the successful completion of its Third Annual Seminar. The meeting was over-subscribed and from everyone that I have discussed it with, very much a success. Other matters prevented me from attending so am happy to report that Dr. Lewis Rattner, who has just this year joined my staff at the University of Cali-

From left to right, Sid Kohn, Fran Bushnell, Lloyd Richards, Ron Light.

fornia, did a fine reporting job for me and the following stems from his literary ability and good spirit at helping out.

On September 12, in the beautiful Yosemite National Park, the Third Annual Seminar of Northern California Unit was held.

The seminar topic, "Interceptive Orthodontics," was most timely by virtue of recent controversies on this issue. The speakers, eminently well qualified by training and practice, were: Sidney I. Kohn, D.D.S., Professor of Pedodontics, Fairleigh Dickinson University; Eugene E. West, B.S., D.D.S., Assistant Professor of Orthodontics and Chairman of the Division of Orthodontics, Univ. of California, School of Dentistry; Francis B. Rudine, D.D.S., Assistant Clinical Professor of Interceptive Orthodontics, College of Physicians and Surgeons, San Francisco.

It will be noted that these speakers included a practicing pedodontist, Dr. Rudine; a practicing orthodontist, Dr. West; and a man trained and qualified in both specialities, Dr. Kohn.

As the papers presented are being prepared for publication it would be redundant to quote at length from them. The consensus, after discussion, was that where a developing malocclusion, occurring either in primary or mixed dentition, that interferes with the full development of hereditary potential is recognized, it can and should be treated by a knowledgeable and capable pedontist. Where a developmental anomaly occurs which will lead to a malocclusion, this case should be under the guidance of a trained orthodontist. This would be in line with the work shop recommendation as presented in the JOURNAL OF DENTISTRY FOR CHILDREN, First Quarter of 1958, pp. 3-9.

Entertainment, including a special ladies program, was outstanding and encompassed a golf tournament, cocktail party and two fine banquets. A special guest speaker, Mr. James Robinson, Executive Secretary of the Southern California State Dental Association, was inspiring and interesting as was Haywood Norton, Texas' gift to California and our Unit's immediate Past President. Haywood is one of the best sleight of hand magicians in the United States.

The committee of Doctors Burley, Bushnell, Doster, Heltne, Light, Mack, Matkin, Sweet (Sr. & Jr.) deserve special recognition for a job well done. Lloyd Richards, president of the Northern California Unit and Charles Sweet,

The men in this picture, from left to right, are Doctors Kohn, Sweet, Rudine, Richards, Bushnell and West. See if you can match them up with their respective spouses!

Jr., chairman, did yeoman work in keeping all speeches brief.

Ed Mack was selected as Seminar Chairman for next year and through his experience and ability we are assured of maintaining the high standards set.

Southern California

Reliable George Higue lists for us the new officers who were elected at the June meeting. They are: Robert C. Read, president; William E. Allen, president-elect; Mario Frisco, vice-president; Wally May, secretary-treasurer; and John P. Kennedy, George Higue, Donald McAnlis, Ronald V. Jones, and Mode Perry, directors. Editor Bernard Z. Rabinowitch was appointed ex officio to the directors.

Incidentally, Editor Rabinowitch does an excellent job with their quarterly bulletin, *The Children's Chair*. The latest issue just crossed my desk and is replete with book reviews, abstracts, editorials and news items.

But that's not all. Their efficient executive secretary, Miss Lorraine Duncan, keeps me well plied with all their meeting announcements.

Francis V. Howell, D.D.S., M.S., discussed "Mucosal Lesions in Children" at the September meeting. Don B. Chatterton, D.D.S., one of the "local" boys lectured to his Unit on "Prosthetic Dentistry for Children" in October, and the November get-together was the occasion of the annual Table Clinics meeting. As you can see from the following list, the topics included just about everything.

1. Removable Preventive Orthodontic Appliances for the General Practitioner; Educational Aids to Better Patient-Dentist Relationship—Donald R. McAnlis
2. Repair of Fractured Anterior Teeth—Richard G. Bauer
3. Treatment of Anterior Spaces with a Fixed Appliance—William D. Mellert
4. Variation in Therapeutic Pulpotomy—James J. Leib
5. Anatomical Substrate for Maxillary Anesthesia—Jess Hayden
6. Cuspids—Bernard Rabinowitch
7. U.S.C. Group Clinic—Clinton Emmerson
8. C.M.E. Group Clinic—Stanley L. Shephard and Franklin Nelson, assisted by the following students: Richard Pfeiffer, Robert Steen, David Asatani and Euel King
9. Quadrant Dentistry for Children—Walter B. Hunter
10. Early Treatment of Cross-Bites—Theodore S. Martin

Colorado

President Lou Dubin sent in not one but two articles. Thanks a million, Lou. You did such a complete job in the second report that it's all here—word for word.

The Colorado Unit of ASCD began the year 1958 with an exceptionally well attended luncheon in the new Denver Club, during the Denver Dental Association mid-winter meeting. Over 85 men were present and many men joined our Unit, bringing our membership to 102 members. Guest and speaker was Dr. Louis I. Grossman of the University of Pennsylvania who spoke on the "Replantation of Primary Posterior Teeth."

After a summer of vacations, the study club has begun its new project of "Nutrition" with over 20 men assigned to do the reading on the various phases. We hope to culminate this project at our Seminar in May with a top nutritionist as our guest and clinician.

Ben Kletsky has been installed as President of the Denver Dental Society following Bill Humphrey, who had a very successful year. Two pedodontists in succession—not bad.

The ASDC was well represented at the Colorado State Dental meeting at the Broadmoor Hotel in Colorado Springs

with Jack Eisenson, Kenneth Martin, Olaf H. Jacobson, Willard Guard and Bill Humphrey, who presented a table clinic covering the making of bands and space maintainers, pre-medication, and interesting cases.

Our pedodontic ranks have been swelled to 22 in Denver alone, with the addition of the new men who took the Colorado State Boards this summer. We are sure that they will become members of our Society at our first regular meeting in November.

And to quote our Dr. Paul Barker, "We have been crawling and are now learning to walk."

Georgia

Activities in the deep south have sorta slowed down a bit, but things are brewing. It is hoped that some type of meeting will be held during the Hinman Mid-Winter Clinic in March as has been the practice in the past. A committee is already laying the groundwork for next year's seminar meeting.

Virginia Englett and Ted Levitas were delegates to the ASDC meeting in Dallas (but Virginia did all the work!).

Idaho

Just a quickie this time from old reliable Wes Young. Even though, as Wes puts it, their activities are spasmodic—not year-round, he took time to say hello and let us all know the boys out yonder are alive and kicking. We'll be looking for more next quarter.

Illinois

A new reporter checks in this time—Jane W. Selbe from Skokie. Her maiden effort is so good, it wouldn't be fair to deprive you, so read on.

Charles Carpenter, prexy of the Illinois Unit presided over the fall meeting held in the Hotel Pearson, Chicago, on October 1. We were honored to have as our speaker Dr. Harold Addelston of New York University Dental School. Dr. Addelston, who is now president of ASDC and past-president of the American Academy of Pedodontics, presented aspects in every field of children's dentistry in a most engaging manner.

Election of officers followed the afternoon session: President, Bert W. Gilbert, Springfield; Vice-President, Lorin B. McEwen, Peoria; and Secretary-Treasurer, Ronald Rothenberg, Skokie. The social hour and dinner were enjoyed by 32 members and guests, followed by an evening session.

Our program chairman for '59, Stanley Korf, and his co-chairman William Sowle, have our speaker on board for the Chicago Mid-Winter meeting. As usual we will have a luncheon on Tuesday, February 10 at the Conrad Hilton Hotel. Dr. J. R. Blayney will give us "The Evanston Story." Of course any ASDC members out-of-state attending the convention will be most welcome. Also irons are in the fire for an April Seminar to be held in Rockton at the Wagon Wheel. We think these meetings just might be worth marking on your calendar. See you and any friends interested in dentistry for children in February!

Indiana

Also from the distaff side comes the Hoosier report. Elizabeth Graves initiates her editorial efforts with this issue, and we're glad to have her aboard.

She writes that on October 3, 1958, members of the Indiana Unit had their annual fall meeting in Bloomington, Indiana. It is always held in conjunction with the Indiana University Dental

Alumni week end. Richard Jennings, program chairman, introduced our speaker, Joseph R. Jarabak, D.D.S., M.S., Ph.D. His subject, "Interceptive Orthodontics," was well presented and made particularly interesting by his use of dual slide projection and a flannel board that "glowed." Everyone felt it was a most successful meeting.

The officers for the coming year are: Emory W. Bryan, president; Richard Jennings, president-elect; D. C. Dicks, vice-president; and James R. Roche, secretary-treasurer.

Maryland

John Sharpley came through again and brings us up to date. New officers who were elected for the coming year are: Douglas J. Sanders, president; Saul Blumenthal, president-elect; William Schunick, vice-president; John H. Sharpley, secretary-treasurer; and H. Burton McCauley, historian.

Dr. Irving Abramson, president of the Baltimore City Dental Society, spoke to the September meeting and his subject was "Injuries of the Teeth from 6 to 16 Years of Age." In November, Dr. Sidney I. Kohn, president of the American Board of Pedodontics (among many other positions) was the speaker.

Plans are already underway—as they should be—for an outstanding observance of Children's Dental Health Week, and John promises more on this later.

Michigan

My predecessor, modest Mel Noonan, writes of the doings in our editor's home state. (Thanks for the kind words, friend, and keep the news coming.) Speaking of news, here's what he had to say:

Under the guidance of President Bill Graetz the Michigan Unit has been very active. The main activity at present is the drive for new members. An invitation to join is being sent to each member of the Michigan State Dental Association and there are high hopes for a good response.

The officers also are busy on plans for honoring the hygienists at the annual state meeting next April. The hygienists who are associate members have been very active and helpful and deserve this recognition.

The December meeting was held at Fort Shelby Hotel and the featured essayist was none other than M. Michael Cohen of Tufts on the topic "Peridontal Dusturbances in Children."

Minnesota

Rocky Schwarzrock did his usual fine job once again and brings us news of his Unit just south of the border.

A grand total of 192 men and women, dentists from Minnesota and other states, attended the Ninth Annual All-Day meeting of the Minnesota Unit on September 12.

The program for this terrific event was provided by Doctor Ralph E. McDonald of the University of Indiana, and Dr. Laren Teutsch of Creighton University.

Officers of the Minnesota Unit for this year are: president, Rudy B. Delton; vice-president, Walt G. Iverson; secretary, R. G. Petersen; and treasurer, E. L. Brown.

Forty-three dentists attended a symposium on the control of caries presented on October 21. The panel consisted of Doctors Elwin Luhring, of Fairbault, Minnesota; Robert Kelly of St. Joseph, and Art Bennett of St. Paul.

The Minnesota Unit voted to contribute one dollar toward each student

membership in the ASDC to encourage such memberships.

The speaker for the January 20 meeting is scheduled to be Doctor F. J. Fleege of Milwaukee, Wisconsin, on the subject of diagnosis, x-ray, treatment, caries—the problems of dentistry for children.

The Minnesota Unit twenty-five dollar award for outstanding work in dentistry for children by a graduating student was awarded to William E. Spindler. The ASDC awards of membership and JOURNAL subscription went to Robert H. Nitschelm and Robert W. Gerlicher.

MISSOURI

A personal letter from Unit president Neal Newton doubles as the "Show Me" state's news report this time. It's too good to edit, so look over my shoulder and read.

Dear Ted,

I wish to apologize for that lack of correspondence from a proud Missouri Unit. I have personally put the "squeeze" on our secretary, but am enclosing this bit of information in case he did not frighten easily. The old "Show Me" Unit now has about 170 members, an increase of about 70 members over the last three years. The election at the State Meeting last May resulted in the following:

President, W. Neal Newton, D.D.S.
Vice-President, Quentin Ringenberg, D.D.S.
Secretary-Treasurer, Edward Brungard, D.D.S.

We have a very good program for the year. Last month we sponsored William Via of Detroit on "Special Problems in Dentistry for Children." In February we are having Joseph Burket of Kingman, Kansas, on "Pedodontics in General Practice." In April we will have a Pedodontic Seminar for the senior dental students of the three Missouri Dental Schools. Then in May we will have a business meeting and program at Springfield, Missouri, during our state meeting. Our delegates, Cornelia Thompson and John Clayton, will represent us at the Dallas meeting. We were happy that the American Academy of Pedodontics chose St. Louis for its meeting this year despite the heat. We have several Academy members from our state and Jack Wells, Jack Gilster and myself were guests this year from our Unit, and it was a fine session.

Perhaps you might like this news item also. The department of Dental Pediatrics, Washington University School of Dentistry, announces a two-day course in "Dentistry for Children," March 11 and 12, 1959. Applicants, write Registrar, Washington University School of Dentistry, 4559 Scott Avenue, St. Louis 10, Mo.

I hope Ed Brungard comes through with a letter to you; however, I am enclosing this small morsel for you to chew if he fails. I just wanted you to know, on presidential authority, that we of the Missouri Unit are not non-vital!

Sincerely,
W. Neal Newton, D.D.S.

NEW JERSEY

Last May, this Unit honored a Springfield N. J., school nurse, Miss Florence Gaudineer for her work in establishing one of the most effective school dental health programs in the country—so reports past president Saul Gale.

Shorty Gale had lots more to report—and here 'tis.

The following officers were elected at our last annual meeting: president, H. Milton Cooper of Hackensack; president-elect, Robert D. Moyer of East Orange; vice-president, H. Curtis Hester of Glen Ridge; and secretary-treasurer, Wilfred W. Jordan of Cranford. Walter

Shorty Gale presents the Annual Award of the N. J. Unit to Miss Florence M. Gaudineer, Springfield school nurse.

Schwartz and Melvin Bellet were appointed editor and business manager respectively.

Our membership chairman, Fred Lauer, is doing a grand job and we now have a membership of approximately 300.

On October 29 our Unit sponsored a one day seminar on pedodontics at the Seton Hall College of Dentistry. Dr. Maury Massler, Professor and Head of the Department of Pedodontics, University of Illinois, was the clinician and speaker. Much study was given to pulp preservation and oral habits. This seminar proved most enjoyable and informative to the many men in attendance. Elias Lisman, who arranged the program, did a marvelous job and was highly commended for his efforts.

On February 4, 1959, at the Suburban Hotel in East Orange, Curt Hester, our program chairman, has arranged a most interesting Mid-Winter meeting. There will be 12 table clinics offered by our own members during the afternoon. This will be followed by a cocktail hour and a full course dinner. Following the dinner, our short business meeting will be held. At the conclusion of this meeting, Dr. Robert E. Moyers, Professor of Orthodontics, University of Michigan, will discuss "Interceptive Orthodontics."

New York

And here comes Charlie Beck again! This guy just doesn't miss. Listen to all he has to say:

The New York State Unit has been pleased to report the expansion of membership with an accent on the formation of local groups throughout the state. We now have six areas active with their own programs and meetings with more in prospect in the near future. Our annual fall meeting was held this year at the Nelson House in Poughkeepsie and was enjoyed by many members and their ladies. The ladies of both political convictions enjoyed the Franklin Roosevelt estate Hyde Park as well as the Vanderbilt Mansion and Vassar College.

The essayist for the meeting was Dr. Nicholas A. DiSalvo, Director, Division of Orthodontics, Columbia University School of Dental and Oral Surgery. His subject, "Post Eruption Changes in Teeth, Related to Mastication Stresses," was enjoyed by all and his supporting table clinicians did an excellent job.

The spring meeting will be held in the Albany area with Robert Clyman as chairman of the committee for arrangements.

M. Joel Freedman and ASDC president Harold Addelston have reported great things for the big meeting in New York in September. The Commodore Hotel is ours and this is one of the best in the city. It has even been arranged that the American Academy of Pedodontics meeting preceding the ASDC will be at the same place so there will be no transportation necessary. Along with an exceptional scientific program,

full consideration is being given to opportunities for seeing this great city. The wives of New York members are busily at work on plans for fashion shows, shopping trips, sightseeing and "night-lifeing" so we hope that everyone will seize this opportunity to come to the Big Town.

But that's not all. Just take a look at the fine program sponsored by the

METROPOLITAN SECTION

during the Greater New York Meeting which was held in early December. Mark Wallach did the reporting, and, as you can see, these fellows really planned a program:

SEMINARS

1. ALEXANDER, ROBERT H.—*Orthodontist.*
"INTERCEPTION OF MALOCCLUSIONS"

2. CHERNOFF, LEON H.—*Instructor in Pedodontics, N.Y.U. College of Dentistry.*
"PRACTICE MANAGEMENT IN PEDODONTICS"

3. FEINBERG, HARRY—*Asst. Professor of Orthodontia, N.Y.U. College of Dentistry.*
"ORAL HABITS AND MUSCLE TRAINING"

4. KORNBLUH, EDWARD C.—*Instructor in Pedodontics, N.Y.U. College of Dentistry.*
"TRAINING THE CHILD PATIENT"

TABLE CLINICS

ANASTASIO, ALFONSO—*Dental Staff, St. Francis Cardiac Home, Roslyn, L. I.; Formerly Supervisor, Guggenheim Dental Clinic.*
"Local Anesthesia in Pedodontics"

BECK, CHARLES F.—*Attending Dentist, New York Hospital, Westchester Division; Supervising Dentist, Tarrytown Schools.*
"Amalgam Restorations in Pedodontics"

FASS, ELIAS N.—*Instructor in Pedodontics, N.Y.U. College of Dentistry; Asst. Attending Dentist, Polyclinic Hospital.*
"Diagnosis and Treatment Planning in Pedodontics"

GORDON, SHERMAN E.—*Diplomate, American Board of Oral Surgeons; Associate Oral Surgeon, Kings County Hospital; Oral Surgeon, White Plains Hospital; Visiting Oral Surgeon, Grasslands Hospital.*
"Oral Surgical Considerations in Pedodontics"

GREENBERG, BERNARD—*Chairman and Associate Professor of Endodontics, Fairleigh Dickinson College of Dentistry.*
"Filling Root Canals of Immature Permanent Teeth"

LISMAN, ELIAS—*Diplomate, American Board of Pedodontics; Instructor in Pedodontics, Fairleigh Dickinson College of Dentistry.*
"Treatment of Fractured Anteriors"

SAMUELS, ISADORE M.—*Diplomate, American Board of Pedodontics; Asst. Professor of Pedodontics, N.Y.U. College of Dentistry; Pedodontist, Beth Israel Hospital, N. Y.*
"Radiography in Pedodontics"

SCHERTZER, LEON—*Member, American Association of Endodontists; Endodontist, Beth Israel Hospital, N. Y.*
"Endodontics in Pedodontics"

SCHLEIFER, ELEANOR—*Dental Hygienist.*
"The Dental Hygienist in Pedodontics"

SHAPIRO, MORTON L.—*Diplomate, American Board of Periodontology; Section Head, Periodontia, L. I. Jewish Hospital.*
"Periodontia in Children"

SCHWARZ, RUTH—
"Put Your Assistant to Work. The Inside Story of Practice Management."

SCHWARTZ, WALTER—*Pedodontist, Beth Israel Hospital, Newark, N. J.*
"Space Maintenance"

"PANEL DISCUSSION OF PROBLEMS IN PEDODONTICS"

The Panelists are the Chairmen of the Departments of Pedodontics of the four Dental Colleges in the Greater New York Area.

HAROLD K. ADDELSTON—*New York University*

ABRAHAM KOBREN—*Seton Hall University*

SIDNEY I. KOHN—*Fairleigh Dickinson University*

SOLOMON N. ROSENSTEIN—*Columbia University*

Moderator: DANIEL F. TOBIN—*Director of Guggenheim Dental Clinic*

North Carolina

Leave it to the Tar Heels not to be outdone—and Roy Lindahl continues to protect their interests, at least as far as our JOURNAL is concerned. Well, don't stop, Roy! Give heed:

The North Carolina Unit is looking forward to a good year under the guidance of its president, Don Henson. At the present time the Unit is making plans for the Fifth Annual Spring Seminar. During the last business meeting it was decided to conduct one other Seminar each year at various locations in the state. This change was decided upon to permit an expanded scientific program and to provide the membership with a closer association with the N. C. Unit and the ASDC. Plans are now in progress to implement this Seminar.

The Unit, by official action, has recommended changes in the School Health Coordinating Service of the State of North Carolina to provide a more adequate program of dental treatment for indigent school children. The recommendation was adopted by the House of Delegates of the North Carolina Dental Society. Currently, excellent work is being done by the Unit and the State Dental Society to accomplish the recommended changes. We think that adoption of the proposal will help to elevate the standard of dentistry for children in North Carolina. In all probability, this action would not have been implemented without the support we expressed as a recognized Unit of the American Society of Dentistry for Children.

Ohio

Paul Starkey of Dayton is the newly elected president of the Buckeye Unit and S. J. Scaravelli of Parma is the new secretary. Word also comes from Paul that there are three active study groups in Ohio now and all concerned are looking forward to an active year.

Smooth sailing, men, and let us in on all your doings.

Pennsylvania

President (and our correspondent) Manny Album announces plans for the Unit's two-day convention. It is to be held at one of the state's resorts. President-elect Morton Winkler will be in charge of the program.

News also comes of the sudden passing of Jack Wisan, who had always been an inspiration to the Unit. His absence will be sorely felt.

More news comes by way of Manny from the

Philadelphia Section

William Binns is the new president, and Morton Cohen, vice-president, and Ben Grossman, secretary-treasurer, are serving with him. ASDC president Harold Addelston was the clinician at their December meeting, and plans have been made for Dr. Kenneth Easlick of Michigan to present a postgraduate course in January.

Incidentally, Manny did a good job with his presentation at the Dallas meeting.

Rhode Island

Herbert Underhill, secretary-treasurer and correspondent, pulled the neatest trick of the quarter. Those boys in the smallest state have one of the busiest programs so Herb decided to report on *everything*—but in outline style. To say the least, this is a new approach. It's such a novel idea, here's the whole thing just as he wrote it:

I. Meetings

A. First Regular Fall Meeting—Held October 20, 1958.

1. Attendance—Good
2. Speaker—Dr. H. Berk—excellent verbal and graphic presentation with the aid of his good movie.
3. Special homage was paid to the late Dr. Jack Wisan, the actual founder of the Rhode Island component of the ASDC.

B. Subsequent Meetings.
1. Monthly meeting plans include
a. Panel clinic on cleft palate disabilities
b. Program on dental practice management
c. Orthodontic clinician
d. Clinical use of hypnosis in pedodontics

II. Membership
A. Annual Fall Drive for members.
1. The entire State Society was invited to the first meeting
a. Applications were included with invitations
B. Membership committee waging active telephone campaign
C. We now *boast* that our membership includes almost one-fourth of the entire State Society and almost all of the new practitioners in the state.

III. Activities.
A. Panel Discussion Team on Dental Health.
1. A team is being formulated by the Unit that will be available to local groups (PTA, medical societies, etc.) for the purpose of bringing dental education to the public.
B. Table Clinics by the RISDC for the State Meeting
1. An active effort to present table clinics sponsored by the Unit is underway.
C. Dental Health Advertisement.
1. Active support and participation has started for presenting dentistry to the public via commercial media (billboards, posters, radio and television) with particular emphasis to coincide with National Children's Health Week in February.

There is more in the offing, but I'll tell you about it in my next note.

If he calls this a note, I'd hate to see a letter! Seriously, though, Herb, thanks for a swell job and we will all be looking forward to your next few thousand well chosen words.

Tennessee

Here we go again. Reporter Harold Meachem has come through with a jimdandy.

At the present time, the Tennessee Unit is very busy. First, we are starting a state-wide membership campaign. Our membership now stands at 94 and we feel that this should be greatly increased, under the able leadership of our new president, B. F. Gunter, Nashville. I believe by this time next year our membership should be doubled.

Robert H. Fesmire, Nashville, is chairman of our membership and local units committee for the state. He is a hard worker and a most capable man.

Second, we are making plans for our May meeting of next year. From all indications, we will have an excellent program and hope that you will be able to attend.

Robert F. Taylor, president-elect, Memphis, R. Parker Graham, vice-president, Nashville, and Dr. Gunter have expressed their desire to have more local groups within our state. At present, we have one, well organized, at Memphis. Robert F. Taylor is the president, E. S. Lane is the president-elect, Donald W. Crone, is the vice-president, and James P. McKnight, University of Tennessee, is the secretary-treasurer.

From my correspondence with Dr. McKnight, the meetings have been excellent and well attended, thus far; I have been unable to attend any of the meetings but do hope I might be able to in the future. We have another group meeting, but as yet they have not formally organized as a unit and this one is at Chattanooga, under the leadership of Robert E. Pope.

Nice going, Harold. This really makes my job easier.

Washington

Bob Morrow of Opportunity (no kidding!) did not let the deadline pass him by and used the opportunity to send in another swell report! This, too, is published in its entirety.

In December, Spokane entertained the Washington State Component of the ASDC.

The Conference featured Dr. Francis Fleege, of Milwaukee, Wisconsin, as main clinician. He discussed such areas as prophylactic orthodontics, use of x-ray in children's dentistry, premedication, management of child patient and parent, case presentation and space management problems. A series of table clinics augmenting the clinician's material was presented by members of the Society.

The Annual Pacific Northwest Conference of the ASDC was held at Gearhart, Oregon, in October. The states of Oregon, Washington, Idaho, British Columbia and Montana were represented by 88 dentists and wives, and/or sweethearts. A very fine clinic was presented by Sidney Kohn on the subject of prophylactic orthodontics. Gearhart is a seaside resort and presented a very fine opportunity for plenty of golfing, deep sea fishing, and rest and relaxation, since all the sessions were held in the morning.

Wisconsin

No less than 18 new members were signed up by this Unit at the time of its annual meeting in October. President-elect Leland Crosby attributes this success to the simple fact that application blanks were distributed at the beginning of the meeting. This only bears out the point that most practitioners would join —if only they were asked.

A supplemental report came in from Secretary-Treasurer Fred Druse who said that Dr. Galen Quinn, the clinician, contributed mightily to the success of this meeting. Leland went as far as to say it was the finest meeting in their Unit's history. Good deal, men. Keep up the fine work.

Addenda

Northwestern University Dental School recently announced a number of postgraduate courses and conferences, three of which, in particular, may be of interest to our members. "Prosthetic and Orthodontic Rehabilitation for the Cleft Palate Patient" will be offered April 6 and 7, 1959. "Pedodontics" will be offered April 15 and 16, 1959, and a "Conference for Teachers of Pedodontics" will be held June 8 and 9, 1959.

Complete details about any of these may be secured from the school, 311 E. Avenue, Chicago 11.

(For another announcement, see the Missouri Unit News Report.)

• • •

Dr. Mabel F. Wood, director of dental activities for New Orleans public schools has sent in a copy of her annual report. It states that the objectives of their program are education, prevention and correction. Based on the interesting and informative material included in her report, one would have to conclude this lady is doing an excellent job and is certainly taking strides toward achieving her objectives.

Anyone interested in programs of this sort could certainly get valuable information from Dr. Wood by writing her c/o New Orleans Public Schools, 703 Carondelet Street, New Orleans 12.

Israel Shulman, a reader and member from Washington, D.C., has contacted Al Seyler with what could be an excellent suggestion. Dr. Shulman would like to see our JOURNAL publish, regularly, a listing of meetings, seminars, etc., of the component Units so that anyone interested might take advantage of them. Sounds like a good thought. Let me hear from you, and perhaps this type of service can be instituted.

As a matter of fact, and I feel certain I speak for my boss as well as myself, constructive suggestions of any sort are always welcome. They may not be acted upon for one of many reasons, but at least they will receive consideration. So, suggest.

* * *

Thanks again for your support, and keep up your fine efforts. Happy 1959!

Material entered for Unit News should be sent to Ted Levitas, 340 Boulevard N. E., Atlanta, Georgia. Deadline dates are: Second Quarter, April 25; Third Quarter, July 25; Fourth Quarter, October 25; First Quarter, February 25.

Tranquilizers in Dentistry for Children

DAVID H. SHAMER, D.D.S., DOUGLAS J. SANDERS, D.D.S.,*
AND EDWARD C. DOBBS, D.D.S.**

INTRODUCTION

Development of Chlorpromazine

Research involving the pharmacologic activity of the amine derivatives of phenothiazine has been conducted with increasing intensity since World War II. Early postwar studies in this field centered largely in France. Courvoisier[1] and his group of workers, experimenting to learn the effects of Chlorpromazine Hydrochloride† on a variety of laboratory animals, observed numerous diverse reactions. They noted that apomorphine-induced emesis was blocked, that conditioned reflexes were altered, that gastric motility was slowed, that blood pressure was lowered, and, possibly most important of all, that the action of central nervous system depressants (anesthetics, sedatives, and narcotics) was potentiated by Chlorpromazine. Clinical studies, using Chlorpromazine, were stimulated by the publication of the results of the use of the drug on human patients by Laborit, a French surgeon,[2] who described it as a potentiator of general anesthetics and as an agent which could produce a state of artificial hibernation.

Research at this time assumed a more international character. By late 1953 the drug was in use in the treatment of at least 14 general diseases or conditions[3] and was hailed by some lay writers as a probable wonder drug.[4] However, notwithstanding the fact that many beneficial effects were attributed to Chlorpromazine (and related preparations), it was quickly realized that these compounds exhibited important toxic effects and side reactions.[5]

Chemistry

Chlorpromazine is an amine derivative of phenothiazine, and chemically is described by the formula *2-chloro-10-(3-dimethyl-aminopropyl)-phenothiazine hydrochloride.*[6] Pharmacodynamically, however, the relationship of Chlorpromazine to the parent compound is quite remote; for while Chlorpromazine is noted for its diverse neurologic effects, phenothiazine is used in medicine only in the treatment of intestinal helminthic infestations.[7]

Pharmacology

It is conceded that Chlorpromazine acts principally on the higher neural centers of the diencephalon, selectively inhibiting the chemoreceptor trigger zone, the hypothalamus, and the reticular substance.[8] These centers are believed to control vomiting, heat regulation, wakefulness, vasomotor tone, muscle tone, and secretion of the anterior

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† Chlorpromazine Hydrochloride was supplied for this study as *Thorazine* by Smith, Kline and French Laboratories, Philadelphia.

lobe of the pituitary gland. Consequently, inhibition of activity in this region affects many psychic and physiological processes integrated with the central and autonomic nervous systems and the endocrine glands.

The diverse actions of Chlorpromazine may be summarized as follows:[9]

1. Ataractic—alleviates anxiety, tension, apprehension and agitation, inducing a state of unique tranquility. The condition produced may be described as detached serenity without fogging of consciousness or without depression of mental facilities.
2. Potentiator of central nervous system depressants, such as anesthetics, narcotics, sedatives, and analgesics.
3. Profound antiemetic hypotensive effects.

Chlorpromazine is prescribed for a fairly large number of diseases and mental and emotional states. This fact, coupled with individual variation in response to the effects of the drug, results in a wide range of dosage form. A safe procedure which is followed in many instances is to initiate treatment with relatively small amounts (10 or 25 mg., 3 times per day) and to increase the dosage until the desired results are achieved, but the maximum amount prescribed should never be greater than 200 mg. per day in any case.[10] The dosage indicated for oral administration to children is ¼ mg. per pound of body weight every 4 to 6 hours, and the therapeutic actions ascribed to Chlorpromazine would make this drug appear to be an ideal adjunct in pedodontics. Indeed, Chlorpromazine has been used and recommended for children in the control of nausea and vomiting, for the relief of pain, and for nervous and/or emotional states.[11] Prompted by this information, this research program was initiated. It was not anticipated, however, that Chlorpromazine would emerge as the panacea for all the real or imagined tribulations of children visiting their dentists Chlorpromazine is not without undesirable side-effects. In the first place, some persons exhibit a greater susceptibility to the actions of the drug, which requires a careful and continual evaluation of dosage.[12] Fortunately for dentistry, the side-effects of Chlorpromazine are generally observed after an extensive course of treatment and more often after parenteral than oral administration. It must be borne in mind that Chlorpromazine has a hypotensive effect, that jaundice may occur, and that agranulocytosis has been observed in some Chlorpromazine patients.

These are the more severe side-effects. Probably the most common symptoms to be observed are a degree of drowsiness, mild fever, dry mouth, nasal congestion, and/or constipation. Discontinuance of the drug is indicated if, in the opinion of the prescriber, the deleterious effects of the drug are not more than compensated for by the beneficial results received by the patient.

In determining the best dosages for the pedodontic patients, an attempt was made to ascertain the nature of the emotional trauma that the patients would undergo when anticipating dental treatment. Child behavior patterns are influenced by many factors, the most notable of these being (1) psychologic growth of the child, (2) parental influence, (3) physical condition of the child, (4) the school, and (5) fear.[13] Since most of these factors are ordinarily not within the practical control of the dentist, the problem of modifying the behavior of the difficult pedodontic patient must of necessity be approached from the corrective rather than from the preventive point of view.

Through experience and conversations with parents it was learned that the child is usually not too concerned about the approaching dental appointment until, perhaps, the day before. Then the child often becomes increasingly upset, noticeably anxious and apprehensive, and may have difficulty getting to sleep the night before.

Method

The plan evolved, therefore, was simply the prescribing of the tranquilizer twice—once before bedtime of the night before the dental appointment and again shortly before the child actually sat in the dental chair.

In order to insure the proper administration of the project, a mimeographed form was prepared which was to serve as a worksheet for those students in the pedodontic clinic who were to actually oversee the administration of the drug and as an explanation of the proposed project for the information of the parent, with a place for the parent's signature. The items of information required by the worksheet were the name, age, type of dental treatment, and a brief statement regarding the type of basic behavioral problem exhibited by the patient. The student administering the drug was requested to obtain from the parent information as regards the child's diminished anxiety, sleeping, eating, playing, etc.; and then from his own observations to answer these questions:

1. Was the child drowsy or otherwise not alert?

2. Was there any observable difference in the response of the child to local anesthetics?

3. Was there any change in the child's behavior? If it is considered to be improved, how was it improved?

If the patient received both the 10 and 25 mg. tablets, the questions were to be answered separately following each dose.

Results

The children selected to receive the Chlorpromazine all fell within the ages of 6 and 11 years of age and were receiving operative treatment in the pedodontic clinic. Of the 17 children completing the treatment, 9 were girls and 8 were boys. Of the 2 who received only the 10 mg. tablets, one who a boy and one was a girl.

Answers to the questions on the worksheet indicated that there was no drowsiness or any other ill effects attributed to the drug. Also, where local anesthesia was employed, there was no report of any observable difference in its effect. All the parents reported that they felt their children had been able to obtain sufficient sleep the night before; none reported having observed wakefulness.

Of the 19 children who received the 10 mg. dosage, 5 were reported to show no change in behavior during treatment; 12 were reported to be improved; and 2 were thought by the student operators to be remarkably improved. Of the 17 children who received the 25 mg. dosage, 8 were reported to have demonstrated improved behavior and 9 were reported to be remarkably improved.

	Total Children	*No Improvement*	*Improved*	*Remarkably Improved*
10 mg.	19	5	12	2
25 mg	17	0	8	9

Chart showing behavioral changes in pedodontic patients after administration of 10 and 25 mg. of Chlorpromazine, as were evaluated by student operators. (Two of the children who did not show improvement with 10 mg. did not complete the planned treatment.)

Case Report

The patient was a 9-year-old girl who required rather extensive operative treatment to both primary and permanent teeth. The patient's mother advised that the child had had a "bad" experience with a dentist and, as a result, was frightened by the prospect of further dental treatment. The patient expressed an interest in good oral hygiene, but was noticeably frightened by the anticipated dental treatment. When the mechanical preparation of a molar tooth was started, the patient burst into tears and refused to cooperate further. The prospect of obtaining relief with local anesthesia was rejected; the patient tearfully insisted that she was "afraid of needles."

The patient's mother readily agreed to the administration of Chlorpromazine. The patient returned for the next appointment having taken the 10 mg. dosages. The attitude of the child was that of willing cooperation. However, when the cavity preparation was begun, the patient again complained of pain and finally broke down into tears. Anesthesia was again rejected.

The patient returned for the next appointment having taken the 25 mg. dosages. Once again the attitude of the patient was that of willing cooperation. However, on this occasion the patient asked if she might receive "a needle for the pain." She added, "I don't like needles, but I'm not afraid of them." Anesthesia was readily administered. The patient continued to sit impassively through the treatment. Her disposition was that of being lightly preoccupied with her own thoughts. After preparation of a Class II cavity as well as a Class V buccal cavity on a first upper permanent molar, the patient informed the operator that she liked anesthesia and wanted it for future operative treatment.

Future visits were without premedication. Anesthesia was requested subsequently by the patient and administered without difficulty. Without premedication the patient showed a tendency to be more talkative and soon grew restless, but otherwise ceased to be a behavior problem.

It was the unanimous experience of all the operators who reported the results of using Chlorpromazine that while the patient came to the chair quite tranquilized and ready to accept dental treatment, this condition did not always continue after the patient was subjected to operative pain. The patients appeared to be unconcerned about the anticipated dental treatment until the stress of continuing operative pain seemed to "awaken" them to reality. However, as in the case presented above, the patients were not hesitant in accepting local anesthesia when suggested, some even requesting it.

Conclusion

From the above discussion, it can be concluded that Chlorpromazine Hydrochloride may be useful as an aid in the control of problem pedodontic patients. The value of Chlorpromazine will probably be found in the serene mental attitude induced by the drug. The administration of Chlorpromazine is not considered to be a solution in itself; the tranquilized state is not always observed to withstand the trauma of pain. Rather, the dentist may take advantage of the patient's receptive attitude to dental treatment by explaining what is being done, why it is necessary, and how the opportunity can be used to abolish pain by the administration of local anesthesia.

The combination of an effective analgetic (codeine) with the tranquilizer may promote not only tranquility but some degree of pain-freedom.

Because of the poor public reception of Chlorpromazine, probably due to unfavorable publicity, the drug was administered to an insufficient number of children to demonstrate any reliable results, and therefore this project is considered as a pilot study. The results are regarded as promising enough, however, to warrant the suggestion that administration of Chlorpromazine to a larger number of patients and, where necessary, in larger doses is worthy of consideration.

SUMMARY

An attempt was made to evaluate the usefulness of Chlorpromazine in the control of pedodontic patients who exhibit behavioral difficulties in the dental chair. Of 34 parents approached, only 19 permissions were granted. Two of these 19 patients received only 10 mg. doses, while 17 were given, in addition, a 25 mg. dosage. The 25 mg. dosage was effective to varying degrees in all cases. The tranquilized attitude did not persist after intense or prolonged pain. It is thought that Chlorpromazine can be used as an adjunct in pedodontic practice if the dentist takes advantage of the receptive attitude of the tranquilized patients to indoctrinate them into better acceptance of dental treatment.

FOOTNOTES

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Jacob M. Wisan, 1896-1958

Dr. Jacob M. Wisan, known for his many activities in dental public health and dentistry for children, died on October 4, 1958 at the age of sixty-two years.

Jack held many offices in the American Society of Dentistry for Children, and was keenly interested in its activities. He served as President in 1946-47.

Dr. Wisan leaves a record of distinction and honor. He was a native New Yorker, born in Staten Island. He received his D.D.S. degree in 1918 from New York University College of Dentistry, and his Master of Science degree in Public Health from Columbia University. He practiced dentistry in Elizabeth, New Jersey, and in Staten Island, prior to his service as Director of Dental Health of New Jersey from 1938 to 1947. During 1948 he was Director of Dental Health Education for the American Dental Association. In 1949 he became Director of the Joseph Samuels Clinic in Providence, R. I.

From 1951 to 1953 Dr. Wisan was Chief of Dental Services at the Veterans' Administration Hospitals both in Brooklyn and in Washington, D. C.

As an educator, Jack served on the faculties of Seton Hall College, Rutgers University, Columbia University and Temple University.

His illustrious career as a dedicated member of the dental profession serves to remind us of his unselfish and generous qualities manifested by his many endeavors encompassing the broad area of dental public health. Jack was a Diplomate of the American Board of Dental Public Health, a Fellow of the American College of Dentists, and a Fellow of the American Public Health Association.

As an author, his contributions indicate his recognition of the responsibilities of membership in the dental profession. Jack wrote many papers on public health dentistry and dentistry for children, and was co-editor of "Dentistry in Public Health," which is the standard text in the field.

For the last five years, Jack served as Director of Dental Health for the Philadelphia Department of Public Health, during which time he established its program of Dental Health for Children. The survey of dental needs of Philadelphia's pre-school children set a pattern for approaching the dental public health problem in other communities.

Dr. Wisan's demise is a great loss especially to the cause of dentistry for children. He has left behind much which will serve to guide and inspire us.

Joseph J. Obst

Adverse Factors in the Developing Occlusion

NAOMI A. DUNN, D.D.S. AND IRVING W. EICHENBAUM, D.D.S.

DENTO-FACIAL abnormalities are incipient in many of the children seen in the dental office today. It is understandable that these malocclusions may occur more or less readily when one pauses to consider the vast variety of facial forces to which the child is heir, and that the resultant of all these applied forces is what we term occlusion. On the one hand are forces[1] which will tend to produce a pleasing efficient masticatory apparatus, on the other are the very same forces, which, when improperly applied, or in an undesirable sequence, will produce unesthetic results. Frequently, normal growth tendencies may negate each other when extraneous factors are brought into play. It appears logical to assume, therefore, that a satisfactory, efficient occlusion is the absolute result of all the forces for normalcy overcoming any tendencies for abnormalities.

Klein[2] states, "It is generally accepted that dental and facial deformities may be the result of many etiological factors, such as hereditary factors, environmental factors, nutritional factors, endocrine dysfunction, premature loss or prolonged retention of *primary* teeth, malformed or supernumerary teeth, loss of permanent teeth, pathological entities, as well as abnormal pressure habits, all of which may function singly or be superimposed upon each other."

Some of the beneficial factors[3] tending to produce a normal occlusion are:

1. Proper shape and correct size of maxillary and mandibular arches
2. Harmonious relationship between the arches and between tooth size and arch size
3. A normal sequence of exfoliation of the primary teeth and their replacement with a normal successor
4. Correct number of teeth
5. No prolonged applications of deleterious external pressures such as finger or tongue habits or sleeping habits, etc.

Arranged against these beneficial forces are:

1. Congenitally missing teeth
2. Premature loss of primary teeth
3. Prolonged retention of primary teeth
4. Trauma and infections
5. Unerupted teeth due to:
   a. Ankylosis
   b. Supernumerary teeth
   c. Occluded or impacted teeth

It is the purpose of this paper to discuss and evaluate some factors which may tend to produce a dento-facial abnormality. The early recognition of many of these conditions, their interception or amelioration is primarily a task of early diagnosis and initiation of treatment.

CONGENITALLY MISSING TEETH

One of the most valued services a dental practitioner can render his young patient is a thorough roentgenographic[4] survey at the age of five years. Usually, at this time, formation of all the permanent teeth, except for the third molars,

can be determined. This examination will, at once, allow an actual count of the teeth present and provide information relative to the stage of development, abnormal formations (such as supernumerary teeth or missing teeth), and furnish a sound basic treatment plan for any malformations uncovered.

The tooth most frequently absent from the permanent dentition is the maxillary lateral incisor (Fig. 1), and the problem presented is most difficult. An accepted method of treatment is to allow or encourage the mesial drift of the canines. This may be accomplished by removing the primary lateral incisors, in order to prevent interference from their roots. It may become necessary to remove primary canines for a similar reason. After eruption the canines can be judiciously altered so as to render them more esthetic. This treatment plan has the virtue of allowing the entire occlusion to adjust mesially, and further, it precludes the need for some prosthesis to replace the missing teeth.

The only logical alternative to this plan is to retain the posterior occlusion, and should the canines erupt mesially move them into proper position. This would entail retention of the incisor spaces and insertion of a suitable replacement at the proper time. There are active proponents of both modes of treatment, however, the authors prefer to avoid the use of a prosthesis wher-

A B

FIGURE 1. A. Left maxillary lateral incisor congenitally missing. B. Right maxillary primary lateral over-retained and undergoing distal movement under the eruptive pressure of the canine. (Orthodontic guidance in this case was instituted to allow the canines to erupt properly. Left canine encouraged to erupt adjacent to central incisor; right canine distal to the lateral incisor.)

FIGURE 2. Premature loss of the primary second molar with no attempt at space retention. This is a site for accumulation of food debris and predisposes to periodontal involvement of the area.

ever possible and utilize the patient's teeth to accommodate the deficiency. One must not lose sight of the fact that frequently these teeth require orthodontic supervision and should not be allowed to drift anteriorly in the hope that "it will straighten itself out."

PREMATURE LOSS OF PRIMARY TEETH

The premature loss of primary molars frequently results in an early anterior shift of the first permanent molar (Fig. 5). This philosophy has appeared in numerous texts and many authors[4] have contributed to the large store of information existing relative to space loss. Not all premature primary molar loss will produce a concomitant space[5] loss, and statistical studies will confirm this; however, the burden of care (Fig.

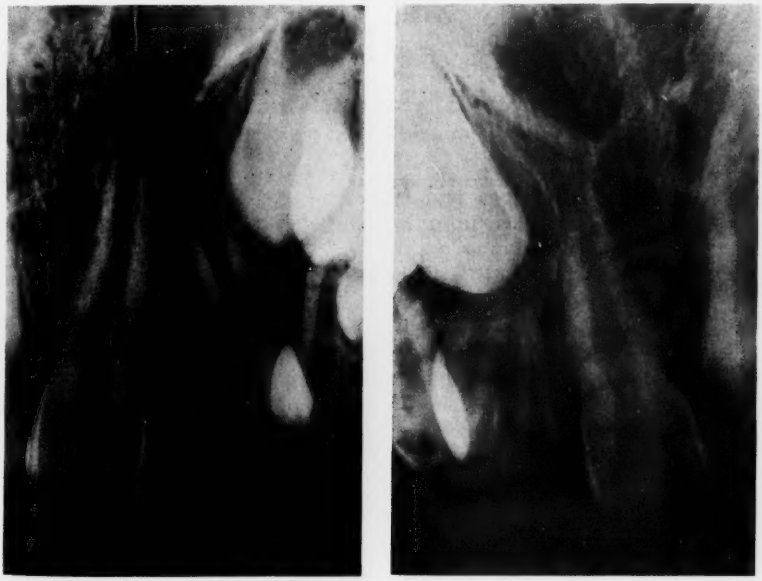


FIGURE 3. Over-retained primary lateral incisors displacing permanent laterals and utilizing areas needed for the erupting canines. Treatment should include removal of the primary laterals, moving permanent laterals into proper position and periodic radiographic survey to observe positioning of the canines.

2) is vested in the dental practitioner. Several authors prefer to measure the space with a tapered tongue blade at frequent intervals and to intervene with a space retention appliance only when actual closure can be demonstrated. It has been the experience of the authors that this practice is honored more in the breach than in compliance. Parents of young patients have a tendency to defer extractions to the end of dental treatment as an unpleasant episode with which to terminate dental care. If more time is allowed to lapse in order to determine mesial tooth movement, frequently these future appointments are not honored, and the child may be seen six months later with a considerable space loss. It is more effective to discuss space maintenance as an integral part of the treatment plan and to initiate steps to provide the appliance immediately after the removal of the teeth.

Prolonged Retention of the Primary Teeth

The prolonged retention of primary teeth[6] is often a severe deterrent to the formation (Fig. 3) of a normal occlusion. The mesio-distal diameters of the primary molars are such as to compensate for a shift anteriorly of the mandibular first permanent molar. Should the second primary molar be over-retained, this shift does not occur at the proper time and prevents the inter-digitation of the mandibular and maxillary first permanent molars. The inclined cuspal planes will not act to make the small adjustments in occlusion which are normal.

The over-retention of the maxillary primary canine (Fig. 4) can be an etiologic factor in the palatal positioning of the permanent canine. This clinical entity presents a treatment problem if the

Figure 4. This canine has been lingually diverted by the prolonged retention of the primary canine. Treatment should include the removal of the primary tooth; surgical exposure of the permanent canine and placement of a stainless steel crown to prevent soft tissue closure. Spontaneous eruption may place this tooth in line. If this does not occur, orthodontic forces should be applied.

canine is unerupted and will tax the resources of the oral surgeon and orthodontist.

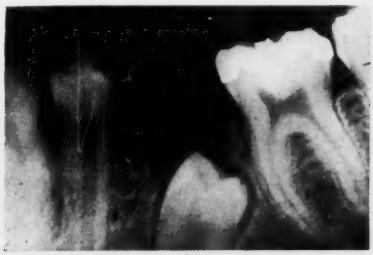
Should the primary canine be retained in the eleventh year, a roentgenologic survey is indicated in order to establish

1. Progress of root resorption
2. Any deflection of the permanent canine

In the event that deflection is present and little or no root resorption evident, the primary canine should be removed. Constant observation should be under-

taken to be certain the space does not close prior to the eruption of the permanent successor.

Mershon[7] describes one method of positioning the canines in the maxillary arch. After surgical exposure, a cavity is prepared in the tooth, and a spring engaged in the cavity to allow orthodontic force to be applied to deliver the tooth. Frequently, the eruptive force of the tooth itself can be utilized by placing a stainless steel or celluloid crown on the exposed canine and allowing the tooth to erupt spontaneously. Should insufficient room be present in the intended area, an orthodontic appliance is inserted to provide the space needed.



A

B

C

FIGURE 5. Lack of root development would appear to delay the eruption of this pre-molar. Space retention was employed to ensure enough eruptive area and to prevent mesial tipping of first permanent molar. Time interval between A and C is two years.

FIGURE 6. Retained primary root and tooth fragments responsible for diversion of erupting pre-molars.

Recently one author, Dr. D. J. Holland, has attempted, with success, the surgical repositioning of the palatally placed maxillary canines. These were cases in which the primary roots, unresorbed, had deflected the permanent cuspids to such an extent that surgical repositioning appeared feasible. These teeth were properly re-aligned surgically,

A

B

C

D

FIGURE 7. A. Blow to child age five resulted in this roentgenographic picture. Huge cystic area diverting developing central incisor into a horizontal position. B. Pathology under control and tooth beginning to turn. C. Pathology removed and tooth in normal position. Root development, previously questionable, appears normal. D. Tooth soon after eruption.

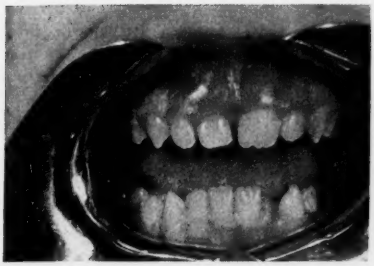


FIGURE 8. Traumatic incident at age three appears to be the only etiologic factor involved in this eruptive pattern.

FIGURE 9. Lack of eruption is due to insufficient root development. This space should be retained to allow pre-molar to complete root formation and erupt.

illustrating one approach to this problem. Early and periodic observation of these areas, however, is warranted to prevent, if possible, these impactions from occurring.

Retained primary root fragments (Fig.

A

B

C

D

FIGURE 10. Four different ankylosed molars demonstrating one or more of the criteria established for diagnosis of ankylosis. In D note invasion of pulp chamber by bony tissue in mandibular first primary molar.

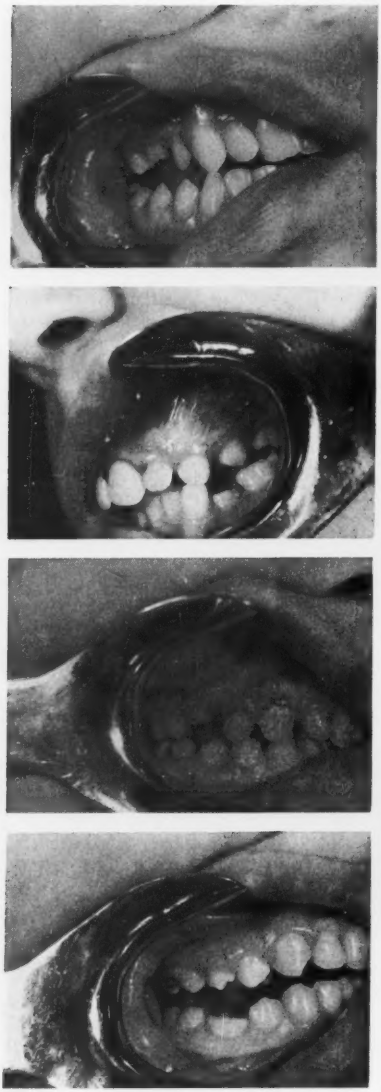
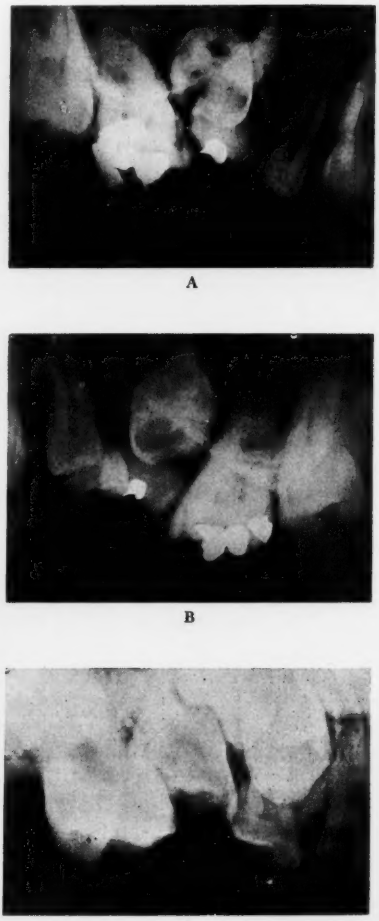


FIGURE 11. Intra-oral views of ankylosed molars demonstrating loss of occlusion.



A

B

C

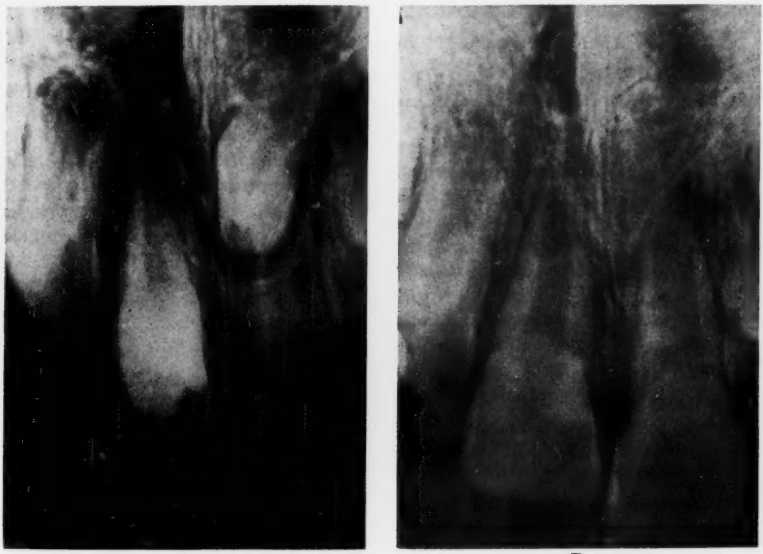
FIGURE 12. A. Two maxillary ankylosed molars which were completely covered by soft tissue. These were discovered by physician seeking etiology of antrum infection. B. Neglected ankylosis of maxillary second primary molar demonstrating clinical crown completely submerged to occlusal surface. First permanent molar in anterior position and obstructing pre-molar eruption.

FIGURE 13. Ankylosed primary molar removed several years prior to roentgenogram but lack of space retention resulted in mesial molar drift to occlude partially the erupting premolar.

6) are often guilty of severe deflection of the erupting permanent tooth. Apparently, these roots, while they in themselves may be mobile, provide sufficient resistance to the succeeding tooth to alter the eruptive path. Retained roots and enamel spicules should be regarded with the same suspicion as the tooth which is over-retained in toto.

TRAUMA AND INFECTIONS

Frequently simple accidents may have their sequelae long after (Fig. 7) the time of accident. Primary teeth which are struck and imbedded in the jaws may penetrate the dental follicle and injure the developing permanent tooth. While the primary tooth may resume its position in the dental arch, the interruption in the process of calcification can produce a local area of hypocalcification and so mark the successor. Long after the traumatic incident is forgotten, the erupting permanent incisor exhibits this traumatic deformity. The



A B

FIGURE 14. A. Two supernumerary teeth preventing completion of eruption of left maxillary incisor. B. Postoperative roentgenogram of six weeks interval showing eruption of tooth continuing.

FIGURE 15. This supernumerary tooth appears to be exerting such pressure as to cause an extrusion of the primary central incisor. Radiographic observations at periodic intervals are most essential in this case.

possibility of delayed eruption or of non-eruption is ever present, as well (Fig. 8).

Infections should always be suspected when a child presents one permanent incisor long delayed in eruption. In the history is usually found some traumatic incident which may have resulted in the loss of a primary tooth. Years later, when the eruptive pattern is bizarre, radiographic observation[8] may illustrate a cystic area deflecting or even preventing the eruption of the tooth.

UNERUPTED TEETH

From the preceding discussion it may be seen that the appearance of the permanent teeth in their appointed places (Fig. 9) at the proper time is a pertinent factor in the establishment of an esthetic and well functioning masticatory mechanism. A large portion of the ills that befall this mechanism are due to dental units which fail to erupt, for a variety of reasons. Some of the more common ones have been mentioned previously; however, the greatest deterrent to this developing dentition are teeth which are unerupted due to:

1. Ankylosis of the primary molars
2. Supernumerary teeth
3. Impactions due to space deficiencies

Ankylosed molars are rather frequent phenomena in the primary dentition. A random sampling of sixty-three youngsters between four and eight years of age demonstrated five with primary molars in varying degrees of ankylosis. These five children had fourteen ankylosed primary molars (Fig. 10), ten of which were in the mandible. The criteria[9] for ankylosis were:

1. Loss of occlusion with the opposing molar
2. Complete lack of mobility
3. Incomplete or lack of periodontal membrane

Invasion of pulp chamber by osseous tissue may or may not be present. This

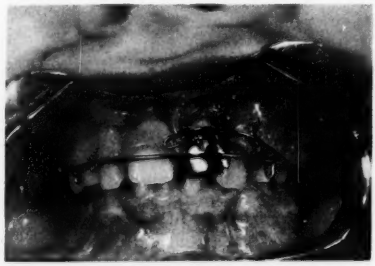


FIGURE 16. One type of successful appliance used to bring an unerupted permanent incisor into position.

problem of ankylosed molars (Fig. 11) appears to be primarily one of early diagnosis and the immediate institution of treatment. Once the diagnostic criteria have been met, the dentition is best served by immediate removal[10] of the involved tooth or teeth and the insertion of an appliance to maintain the space. The adverse effects of an ankylosed or "submerging" molar can be transmitted to the opposing arch and easily to the entire occlusion. Should the molar remain undetected for any period of time, it may even become covered entirely by soft tissue (Fig. 12), with a resultant axial convergence of the adjacent teeth. Further confirmation of ankylosis may be had by percussing the tooth in question; the result being a solid sound giving the feel and impression that "the tooth[9] is an integral part of and fused to the skull."

The effect on the developing dentition (Fig. 13) of one or more of these molars is usually quite marked. In addition to actual space loss, the lack of alveolar bone formation contributes greatly to any subsequent malocclusion. Delay in the removal of these teeth complicates a surgical problem, inasmuch as they must be removed by dissection and the bone overlying the pre-molar removed. In the maxilla, fusion of these teeth to the sinus floor is generally associated with sino-oral opening upon removal of the offending tooth. Early detection and immediate treatment is indicated for these teeth.

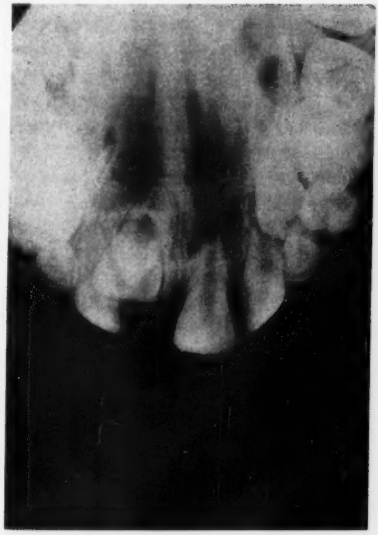


FIGURE 17. Periapical views of supernumerary teeth should be supplemented with occlusal radiographs to place the entire anterior maxilla in proper perspective.

SUPERNUMERARY TEETH

One of the prime etiologic factors in the lack of eruption (Fig. 14) in the anterior maxillary region is supernumerary teeth. These mesiodens are often quite small, lingually placed (Fig. 15) and appear incapable of retarding the eruptive forces of a central or lateral incisor. Once careful radiographic examination eliminates all other factors, the removal of the supernumerary tooth will generally produce beneficial results. The impacted tooth should resume its normal eruptive pattern, but periodic radiographs should be taken to follow its progress.

It may be necessary, following removal of the supernumerary tooth, to expose the incisor in question and place a stainless steel crown in position. This step is performed to prevent the healing of the wound over the crown and to hasten eruption into the dental arch. Should the tooth fail to erupt spontaneously at this time, it may become necessary to

FIGURE 18. This child had a severe blow to the face at age 16 months. In addition to primary root fracture, dilaceration appears to be present at the incisal edge of the right permanent central. Observation of the resorption of these root fragments is important. Unresorbed they may act to retard or prevent eruption of their succeeding centrals; infected they may act in a similar manner. The patient is three years of age at the time of the radiograph.

institute orthodontic force (Fig. 16) to bring the tooth to its proper position. As with ankylosed primary molars, the early detection of supernumerary teeth, which are factors in the impaction, is essential to successful treatment. Here again, the possession of a complete set of roentgenograms (Fig. 17) taken at age five or six is an invaluable diagnostic aid, and its prophylactic value to the child (Fig. 18) and practitioner alike cannot be underestimated.

SPACE DEFICIENCIES

The problem of unerupted teeth due to a space deficiency is usually one of premature loss of primary molars with no attempt at space retention. This clinical picture is seen often and a frequent site is the second pre-molar area. The early insertion of an appliance at the time of extraction would put an end to some of the dental ills which are due to space loss.

Clinically one can see instances where there is a true discrepancy between tooth size and arch length. There has been no premature loss of primary tooth units and yet insufficient arch length is present to accommodate the erupting succeeding teeth. This is a true space or arch deficiency and must be directed for treatment to the orthodontist. Here again, the practitioner must assume the responsibility of patient control and guidance. Proper timing of orthodontic intervention is often as vital to the success of the treatment as is the treatment plan itself. The dental practitioner should direct the patient to orthodontic channels early enough to provide the necessary time latitude.

SUMMARY

The practitioner who treats children should possess an awareness that the dento-facial apparatus of the growing child is viable and constantly changing. A thorough knowledge of normal oral conditions is essential to a proper evaluation of inherent or incipient aberrations. This information, used as a base line, can guide one to anticipate malocclusions and materially aid in their prevention. Often fairly simple measures can intercept these adverse forces

and prevent or ameliorate future orthodontic care.

It has been noted that often a minor incident may act to the detriment of this apparatus at a time far removed from the application of the forces. The complex patterns of intra-oral growth are influenced by a long list of natural tendencies, but many of these are negated or even perverted by extraneous conditions which are within the control of the practitioner. The practitioner must be alert to these adversities to normal occlusion and be ready to translate his diagnostic acumen to the advantage of the child.

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Abstract

How Safe Are Antibiotics? Editorial Quart. Rev. of Ped., Vol. 13, No. 2, pp. 47-49, May 1958.

The Food and Drug Administration in Washington, D. C., has just completed a survey on frequency of severe reactions to antibiotics. Trained professional investigators visited 827 hospitals and interviewed 1,637 physicians checking on definite and suspected severe reactions to antibiotics seen in patients between 1953 and 1957. Data was gathered on somatic responses as anaphylactoid reactions, angioneurotic edema, monilial and mycotic infections, and enterocolitis secondary to antibiotic medication.

A total of 1,070 reactions were judged to be severe, i.e., actually life-threatening. Of the 809 anaphylactoid reactions, 793 were associated with preparations of penicillin. Forty-nine reactions followed the oral administration with no fatalities. In 611 cases penicillin was given intramuscularly without other antibiotics, in 122 intramuscularly along with streptomycin. Of these 733 individuals, 72 died. Of the 46 instances of blood dyscrasia 16 followed chloramphenicol alone (11 deaths) and 25 followed chloramphenicol with other drugs (14 deaths).

The conclusions as pointed out by the authors are numerous and important. They reported that of the 2,500,000 pounds of antibiotics produced in this country in 1956, penicillin represented 960,000 pounds (38 per cent) of the total. Although penicillin has saved tens of thousands of lives in the past 14 years, nevertheless among the 17 currently available antibiotics penicillin caused the greatest number of reactions and was the one most frequently responsible for fatalities. The oral route proved to be much safer than the intramuscular route. Anaphylactoid reactions from penicillin have increased in frequency during the past few years, emphasizing the importance of having a clear-cut indication before its use.

Staphylococcal superinfections, often fatal, may follow the oral administration of one of the tetracyclines; these drugs should be used cautiously, particularly in patients undergoing abdominal operations. With chloramphenicol, only 16 cases of blood dyscrasia were associated with the drug and women were affected two or three times more often than men.

Ten per cent of the population have a proneness to become sensitive during their lifetime to some food, drug, cosmetic, or other substance. Drug sensitivity is an interaction between a patient and an offending agent.

M. M. Album

Dental Caries and a Consideration of the Role Of Diet in Prevention*

THE foundation for dental health is established early in life. The greatest single cause of dental disease is caries which, in turn, is largely a disease of the first two decades of life. The primary teeth are no less susceptible than the permanent ones, and disease in them is not without serious consequence for the permanent dentition. Since those physicians caring for children should be informed of current knowledge concerning the relation between diet and caries prevention, representatives of the American Academy of Pediatrics and the American Society of Dentistry for Children met to prepare a joint statement on this problem. The report which follows represents a summary of the position taken by this Committee.

This report has been reviewed by the Committee on Nutrition of the American Academy of Pediatrics; it has endorsed those portions which relate specifically to nutrition. The dental aspects, particularly the pathogenesis of caries, are the responsibility of dentists. Since there is significant difference of opinion on these problems, even among experimental pathologists in dentistry, the burden of responsibility must be borne by those assisting in the preparation of this report.

Anyone interested in a broad survey on the pathogenesis of dental caries may find a comprehensive statement in a publication of the National Research Council, *Control of Tooth Decay*, from the committee on Dental Health, Food and Nutrition Board (N. R. C., Washington, D. C., 1953).

Dental caries is a disease of the calcified tissues of the teeth. It is generally believed to be caused by acids resulting from anaerobic glycolysis by microorganisms, is characterized by decalcification of the inorganic portion, and is accompanied or followed by disintegration of the organic substance of the tooth. The lesions tend to occur in particular regions of the teeth, i.e., the occlusal fissures of the molar teeth, the contact areas between adjacent teeth, and, in cases of rampant caries, the cervical areas near the gingiva. These are areas which are not self-cleansing.

Lactic acid, which has been demonstrated in areas of initial caries activity (Fancher *et al.*,[1] Muntz[2]) and advanced caries (Armstrong *et al.*[3] and Miller[4]) is the principal acid involved in the caries process.[5] It is derived from bacterial action upon a carbohydrate substrate. Any microorganism, or combination of microorganisms, capable of producing an acidity of about pH 5, which is sufficient to decalcify enamel, can initiate dental decay.[6] The time that the acid must be in contact with the tooth in order to produce decalcification is not precisely known, but from in-vitro studies of adult teeth, may be as short as 10 to 15 minutes.

Whether or not the acid formed will decalcify the enamel of a tooth is dependent on the concentration of the acid, its protection against dilution, and its duration of contact with the tooth.

There are natural factors in the

* Report of the Joint Committee of the American Academy of Pediatrics and the American Society of Dentistry for Children.

mouth which contribute to the dissipation of acids formed on the tooth surface, such as the amount of saliva and the buffering capacity of the saliva.[7] Specific inhibitory factors may play a part.

Of course, variations in the inherent resistance of the teeth to destruction are important in determining the onset of caries.

Factors Determining Caries Formation

Certain conditions are essential for development of dental caries: 1) a caries-susceptible individual or teeth; 2) the presence of acid-producing bacteria which are capable of producing a sufficient concentration of decalcifying acids; 3) the presence of a substrate of orally fermentable carbohydrate; 4) bacterial plaque or accumulations which will concentrate the action of acid at caries-susceptible areas of the teeth.

Most individuals are caries susceptible; less than 5 per cent of the population is immune. Animal studies indicate that caries immunity and susceptibility may be partly a matter of heredity.[8] Klein and associates[9] suggest the same possibilities in humans, but changes in caries activity in a single generation seen in Esquimaux and Maoris following changes in dietary habits indicate that heredity is only a minor factor. Caries activity is greatest during early childhood and adolescence and tends to taper off after maturity is reached. This is believed to be the result of a decreasing susceptibility of individual teeth with increasing exposure in the mouth.

The bacteria necessary for producing acid are always present in the mouth (Miller *et al.*[10]) and in dental plaques. Many microorganisms have been found capable of producing the pH necessary for decalcification of enamel, including: lactobacilli, aciduric streptococci, diphtheroids, leptotrichia, actinomyces, fusiform bacilli, staphylococci and certain strains of sarcina. The lactobacilli have frequently been shown to have a numerical correlation with caries experience.[11]

The substrate necessary for bacteria to produce acid is an important variable in caries attack rate. Fosdick and Burrill[12] pointed out in 1943 that the only available substrates from which acids can be formed in the mouth are the carbohydrates and that easily fermentable carbohydrates, such as sucrose and glucose, are the ones most likely to be quickly converted to decalcifying acids under conditions existing in the mouth.

The importance of the bacterial plaque in the development of caries was pointed out in the early 1890's.[13,14] Williams,[13] in a study of 400 subjects, found that caries invariably occurred under a felt-like mass of microorganisms in which he postulated the necessary acid had to be formed. Recent animal studies[15] support the idea that decalcification occurs principally under fixed deposits on the teeth. Rapid acid formation giving a pH as low as 4.5 has been shown to occur in vivo when sugars are placed on plaques on human teeth.[16]

Various oral conditions may modify the activity of the preceding factors in caries. Principal among these would be: the destructibility of enamel in organic acids as it might be influenced by fluorine or other chemicals; the flow, consistency, neutralizing power and antibacterial action of saliva; irregularities of teeth or tooth surfaces, which contribute to bacterial and food deposits; and the presence of phosphates or other buffers in the food or of certain proteolytic bacteria. The absence of certain

amino acids and vitamin fractions in the mouth may also play a part.

Prevention of Dental Caries

Since resistance to caries is determined in part by the ability of the teeth to withstand caries attack, it is logical that much attention should have been given to the effects of nutrition on tooth structure and caries resistance. The adequacy of the diet is often considered as being related to the dental caries experience. There is, however, a division of opinion concerning the relationship between dental caries and either specific dietary factors or the general nutritional status. Mellanby[17] has offered evidence that teeth formed on vitamin D deficient diets were defective in surface structure and more susceptible to caries, but many have questioned her conclusions. Bunting *et al.*[18] observed 611 children in five public institutions. He concluded that the feeding of an adequate, well-balanced, low-sugar diet definitely decreased the caries activity. Dental caries occurs in well-nourished children, and it is of interest that the condition of the primary teeth of children suffering from malignant nutrition (kwoshiorkor) is reported to be good.[19] There are no data indicating that a lack of minerals (Ca, P, Mg) or vitamins in the diet contributes specifically to the development of caries in humans.

Hence, there is insufficient evidence to claim a casual connection between general nutritional status and caries susceptibility.[20-22] Furthermore, since calcification of all primary teeth is completed by 3 years of age, it is difficult to ascribe cavities which develop in primary teeth subsequent to this age to lack of minerals or vitamins in the diet. Certainly the improvement in the nutritional status of children in the United States during recent decades has not been associated with a decline in the prevalence of caries. Enamel hypoplasia, which is believed by some observers (though not all) to result from nutritional deficiency, is not associated with caries susceptibility.[20]

Whether or not proper formation of the tooth is dependent on adequacy of the diet, it seems clear that once the enamel is complete it becomes relatively unresponsive to systemic influences of a nutritional nature. This is shown by the fact that there is no evidence of repair of carious lesions and the finding that there is essentially no passage of radioisotopes, such as P^{32}, from the tooth pulp to the enamel. The little which does reach the enamel arrives there through the saliva (Sognnaes and Shaw).[23] The nutritional status can influence the integrity of the various periodontal structures[21] and no one questions its importance in maintaining their health.

In practice, the best proven way of increasing the resistance of the teeth and preventing dental caries is by the addition of fluoride to drinking water and the topical application of fluoride. Although other methods of prevention on a mass scale have been attempted in recent years, none has proven effective. The information now available clearly indicates that fluoridation of public drinking water leads to a significant decrease in dental caries. The observed reduction in the incidence rate of decayed, missing and filled teeth (DMF) among children drinking fluoridated water has varied between 30 and 70 per cent in different studies. In general, the magnitude of the reduction is inversely related to the age at which the fluoridated water is first regularly consumed. The caries-preventive effect is compara-

ble to that seen in populations drinking naturally fluoridated water.[24]

Most foods contain fluoride at a level of 0.2 to 0.3 parts per million (ppm) as consumed, except for seafoods and tea which contain considerably more. In this country about 3,500,000 people drink *naturally* fluoridated water. Excessive intake is known to result in mottled dental enamel in children and, when taken in very large amounts over long periods of time, in skeletal fluorosis in both children and adults.[25] No confirmed deleterious effects have been observed in the United States.[26]

The ideal vehicle for dietary fluoride should be such that its consumption is self-limiting, it is easily and cheaply available, and it is readily accessible to regulatory control. The fluoridation of communal water supplies meets these qualifications and is, in principle and in practice, the most effective approach to caries prevention on a large scale. The adjustment of the fluoride content of drinking water to 1 ppm in temperate climates (or about 0.7 ppm in hotter areas) appears to provide an *optimal* intake.* This amount results in significant reduction of caries without evidence of toxicity.[24, 25] To achieve maximal caries-preventive effect, fluoride should be ingested during that time when the teeth are in the formative stage and throughout the caries-susceptible years. This ingestion must cover a period from the fourth month *in utero* (when the first primary central incisors begin to calcify) to the age of 18 years.

Studies of children who have drunk artificially-fluoridated water for periods up to 10 years have failed to disclose any evidence of adverse effects on growth, or general health and well-being, or any changes in skeletal density or rate of skeletal maturation.[27] Twenty-six million people in the United States are currently drinking *artificially* fluoridated water. Fluoridation of communal water supplies is a safe and effective means of caries control and should be extended to as wide a segment of the population as possible.

In areas where fluoridated water is not available, the topical application of a 2 per cent solution of a fluoride to the crowns of the teeth, soon after the teeth are erupted, should be substituted. Many studies indicate a 40 per cent decrease in the dental caries attack rate after such applications. Evidence available suggests that the reduction of caries is related to lowered solubility of fluoridated enamel in acid.

Regulation or restriction of intake of carbohydrate serves not only to foster adequate nutrition but also to withdraw the substrate from which bacteria form decalcifying acids. If strictly enforced, it also reduces the numbers of lactobacilli, which are used by many as an index of caries activity.

There is increasing evidence that between-meal eating and the frequency of eating are related to the dental caries experience of children. Gustafsson *et al.*[28] conducted a well-controlled study of dental caries and observed that a group of patients who received a diet high in fat and very low in carbohydrate, and practically free from sugar exhibited low caries activity. When refined sugar was added to the diet in the form of mealtime supplement, there was still little caries activity. In the same study,

* Recently consideration was given to a plan to include fluoride in milk formulae fed to infants living in areas where fluoridation of community water supplies was not practiced. This plan was rejected as unsafe, since positive control of intoxication under these circumstances was not believed possible.[24]

when caramels were given between meals, there was a significant increase in the numbers of new carious lesions. It was concluded from these studies that dental caries activity could be increased by the consumption of sugar, if the sugar consumed was in a form easily retained on the tooth surface. The more frequent the latter form of sugar was consumed *between meals*, the greater was the tendency for an increase in dental caries.

Mack[29] studied a group of institutionalized children who were receiving an adequate diet. These children received sugar at mealtime only. She studied the effect of further additions of carbohydrate to the diet in the form of candy. This did not significantly increase dental caries activity, but the children did not receive candy between meals and they were encouraged to brush their teeth after meals.

Potgieter *et al.*[30] surveyed the dental status in relation to diet as determined from records of weekly food intake of 864 Connecticut school children. Children who consumed more fruits and vegetables and who had better diets had a lower incidence rate of decayed, missing and filled teeth. The frequency of between-meal snacks also showed a slight positive relationship to the dental caries activity.

Dental caries does not often occur when the daily food intake contains no refined sugar and only minimal carbohydrate. When caries-susceptible individuals are given a low-carbohydrate diet, lactobacilli rapidly disappear from the oral cavity, and in many individuals it has been found that, after reducing the salivary lactobacillus counts by the use of a restricted diet, the carbohydrate intake can be gradually increased without a return of the previously high lactobacillus count. It is not necessary to restrict carbohydrate intake in highly susceptible patients as long as the lactobacillus count remains low. Counts of 10,000 lactobacilli per milliliter of saliva, or higher, are an indication that these organisms are sufficiently active to present a threat of development of caries.[31]

Although a low-carbohydrate diet may provide sufficient nutrients for the average individual, it is not consistent with contemporary eating habits in children, may cause ketosis, and is extremely difficult to maintain. Furthermore, the necessity of a diet which restricts not only simple sugars but also complex carbohydrate is not clear, because, in the joint report of the Council on Dental Health and the Council on Dental Therapeutics of the American Dental Association, it was concluded that starchy carbohydrates are of minor importance in the development of caries. In any case, this is therapy and not prophylaxis.[32]

An occasional pediatrician has questioned the advisability of restricting some of the starches, as well as sugar, in the treatment of rampant dental caries. The fear has been expressed that such a diet might cause unnecessary emotional strain in some children.

The recommended diets[3] can provide the daily allowances of nutrients recommended by the Food and Nutrition Board of the National Research Council. The daily intake of carbohydrate is restricted to 100 gm for 2 weeks. After this 2-week period starch is reintroduced. This procedure produces a rapid change in the oral flora, characterized by a marked reduction in the number of acidogenic bacteria. It is not meant to be a permanent regimen, but one to be followed for a short period of time and for a special purpose.

It is worth remembering that special dietary programs have other implications in childhood. If a child is compelled to eat a diet that is different from that of the other children, even in his own home, and, if the diet is different from the school meal, other children will make life miserable for the child in question. The result may be damaging to the sense of security. This factor should be carefully considered in relation to whatever advantages may be obtained by special diets. It is difficult, because of ready availability, to completely withhold candy from children. It would seem better to provide some candy in the home, to be eaten at the end of a meal, rather than to deny it completely. Furthermore, highly concentrated sources of refined sugar, such as candy, given after meals are apparently less apt to produce caries than if given between meals.

A number of investigators have reported on the decalcifying effect of acid beverages (made effervescent by addition of carbon dioxide or acid by addition of phosphoric or citric acid). McClelland,[33] in 1926, reported that the presence of a pH of 3.5 and below, even if existing for only a few minutes, is a potential source of damage to teeth. West and Judy,[34] in 1938, stated that "when an individual places a piece of ordinary acidified candy in his mouth and allows it to dissolve slowly against his teeth, the concentration of the solution at the surface of the candy will be very high, with a pH in the region of 3.4."

Restarski *et al.*,[35] in 1945, reported: "In an initial experiment some extracted human teeth were immersed in a common . . . beverage. When first inspected after 2 days' immersion, the enamel surfaces were found to be grossly decalcified. Severe destruction of the enamel on the molars of 200 white rats was produced by allowing the animals to drink the popular soft beverage for periods of 5 days or more." However, none of this relates directly to caries in human subjects, and the weight of evidence indicates that carbohydrates taken in liquid form are less destructive than those used in a viscous or solid form.

The role of simple dental hygiene, such as toothbrushing, in prevention of dental caries, while generally accepted, has not been exempt from the type of questioning directed at many other widespread hygienic measures. Nevertheless, few dentists or physicians fail to support the practice of proper brushing of the teeth.

Whether or not prepared dentifrices are more effective than simple brushing with water is, at present, the subject of controversy. Nevertheless, as both the lay public and physicians are targets for considerable advertising by manufacturers of dentifrices, it seems worth including a summary of the report on this subject[36] made by the Council on Dental Therapeutics of the American Dental Association:

A dentifrice is a substance used with a toothbrush for the purpose of cleansing the accessible surfaces of the teeth. Commercial dentifrices are available in the form of paste, powder and liquid. . . .

However, the evidence to date indicates that, when such dentifrices are employed as adjuncts to supervised toothbrushing in controlled clinical investigations, their superiority over conventional dentifrices has not been clearly established.

Controversial evidence concerning the possible usefulness of dentifrices containing urea and dibasic ammonium

phosphate is reviewed in numerous publications.

Some control of dental caries has been reported in controlled and supervised studies of the use of a penicillin dentifrice. Other studies have failed to reveal the same amount of usefulness from this dentifrice. It has not been shown that the unsupervised use of penicillin dentifrice by the general public will result in a reduction of the incidence of dental caries.*

There is a slight increase in the number of penicillin-resistant organisms in the mouths of the users of penicillin dentifrices.

Dentifrices containing chlorophyll derivatives have also been placed on the market. There is some evidence that the use of a chlorophyll derivative in a dentifrice increased the rate of improvement of gingivitis in a special group of children under observation, but this effect was transitory. Other investigators have not been able to observe significant beneficial effect from the use of a "chlorophyll" dentifrice.

Certain new foaming agents have recently been incorporated into tooth pastes, and some of these dentifrices have been promoted with greatly exaggerated claims for "antienzyme" and "antibacterial" activity. Evidence in support of these claims is controversial, and the usefulness of these dentifrices in caries control has not been adequately established.

A paste dentifrice containing stannous fluoride has appeared on the market in some parts of the country. The inclusion of other fluoride salts in dentifrices has not been demonstrated to be beneficial. The published evidence concerning stannous fluoride in a dentifrice is still too limited to form the basis of a reliable evaluation.

Adequate dental supervision by a dentist seems to be an accepted health practice in most American communities, and there is little question that dental supervision can play a part in caries prevention. While there are now a limited number of specialists in pediatric dentistry (pedodontics), supervision must usually be obtained from dentists not limiting practice to children. The pediatrician can recommend that toothbrushing start at about 24 months of age and also that dental visits begin at between 24 and 30 months of age. Then the dentist will have the opportunity to give counsel in general hygiene and also to search for remediable oral pathology.

The pediatrician not only sees children before the dentist but also is able to care for their total health needs. Therefore, it would seem wise to encourage pediatricians to learn more about the dental care of children, and, at the same time, to urge dentists to learn more about the general health problems of children. There seems to be need for co-operation between dentists and pediatricians; this should begin in the medical and dental schools. The dental faculty should have an opportunity to teach the etiology and treatment of dental pathology to medical students, and conversely, dental schools should have a place in their curriculum for the pediatrician to teach those aspects of pediatrics which relate to dental problems. Pediatric hospitals and children's services should have dentists in attendance, and attempts are now being made

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* No mention was made in this report of what may be a real hazard in the use of this type of dentifrice, that is, the possibility of sensitization of the individual to penicillin with consequent unpleasant or even dangerous side effects.[27, 28]

to have dental interns in pediatric hospitals.

Summary

As dental caries is primarily a disease of childhood and appears to be at least in part preventable, the pediatrician is obliged to be interested in this problem and can play an important part in prophylaxis. Present knowledge indicates that the most effective prevention available is the consumption of fluoridated drinking water containing a concentration of fluoride appropriate to the environmental temperature. Reduction of the intake of refined sugar both in amount and frequency has a beneficial effect on caries control. The prescription of diets essentially devoid of all sugars should be used to stem the progression of rampant caries. That this regimen would be as effective when complex carbohydrates are permitted and only refined sugar prohibited has been indicated by some studies. However, any highly restricted program must be considered therapeutic and not preventive and should be under pediatric supervision.

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THE CONSTITUTION AND BY-LAWS*
of the
American Society of Dentistry for Children

THE CONSTITUTION

Article I—NAME

The name of this Society shall be THE AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN.

Article II—PURPOSE

The purpose of this Society shall be the advancement and dissemination to the profession and the public of knowledge of all phases of Dentistry for Children.

Article III—MEMBERSHIP

Section 1. Membership in this Society shall be of five classes: active, associate, student, honorary and honorary associate. Only active members may vote and hold office.

Section 2. ACTIVE membership in the Society shall be limited to members of the American and Canadian Dental Associations.

Section 3. ASSOCIATE members may be elected by the State Units or by the Society and shall be designated as those working in related fields or as dental internes in recognized institutions.

Section 4. STUDENT membership: students of an accredited dental school may be elected by the State Units or by the Society.

Section 5. HONORARY membership may be conferred by the Society on any person who has contributed in an exceptional manner to the advancement of Child Health.

Section 6. Honorary associate may be conferred by the Society on members of foreign societies of dentistry for children.

Article IV—STATE UNITS

Section 1. State Units or Societies which may be organized in conformity with the general plan and purpose of this Society shall be enrolled as constituent Units by a majority vote of the Executive Council upon receipt of an application for affiliation. Classification of membership in constituent Units shall be the same as that of this Society.

Section 2. State Units must have a minimum of 20 active members. Where less than 20, the members shall be considered members of the Society at large.

Section 3. State Units shall send an official delegate or representative to each annual meeting of the Society. One delegate shall be sent to represent each 50 members or fractional number thereof.

Section 4. There may be one official Unit of the American Society of Dentistry for Children for each constituent society of the American Dental Association, or one which

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* As amended November, 1957.

may represent the amalgamation of more than one constituent of the American Dental Association. Component groups may be organized within the State Unit, or without regard to State Unit boundaries, where the members feel that it is justified or desirable for purposes of exchange of ideas or for study and other organized activity concerning dentistry for children. Members of such affiliated groups must maintain their membership in the State Unit in the state in which their practice is located.

Section 5. There shall be a meeting of the delegates representing the State Units at a time prior to the annual meeting of the Society. This meeting shall be presided over by the President-Elect and its purpose shall be the discussion of matters relating to the organization, programs and activities of the State Units. This body may offer such resolutions as it deems advisable to the Executive Council or to the Society.

Article V—OFFICERS

The officers of this Society shall be a President, a President-Elect, a Vice-President, a Secretary-Treasurer, and an Editor.

Article VI—EXECUTIVE COUNCIL

There shall be an Executive Council, consisting of eleven members, with authority to govern the Society in all matters between annual meetings.

Article VII—MEETINGS

Section 1. An annual meeting of the Society shall be held at the time and place of the meeting of the American Dental Association. The exact time and place shall be specified at least three months before the annual meeting.

Section 2. Special meetings of the Society may be called; (1) by the President at the written request of twenty per cent of the active membership; (2) by the unanimous vote of the Executive Council together with a majority vote of the delegates from the State Units.

Article VIII—QUORUM

At a regularly called meeting of the Executive Council, General Business Session or a Committee Meeting, those present shall constitute a quorum.

Article IX—OFFICIAL PUBLICATION

The Society shall publish a Journal to be known as the "Journal of Dentistry for Children" which shall be the official publication of the Society, and shall be published quarterly.

Article X—AMENDMENTS

Section 1. This constitution may be amended at any official meeting of the Society by a two-thirds majority vote of all active members present, provided a copy of such proposed change has been sent to each member at least four weeks prior to such meeting. (Due publication of such change in the Journal of Dentistry for Children shall constitute proper notice.)

Section 2. Amendments may also be made at any annual meeting of the Society by the unanimous vote of all active members present and voting.

Section 3. By-laws may be adopted, amended, or repealed at any official meeting of the Society by a two-thirds majority vote of active members present and voting.

THE BY-LAWS

Article I—MEMBERSHIP

Section 1. All applications for active, associate, and student membership shall be made in writing. When submitted to the Secretary and accompanied by the annual dues qualified applicants automatically become members in the designated class.

Section 2. In States having active Units, membership in the State Unit is contingent upon membership in the American Society of Dentistry for Children.

Section 3. The name of a candidate for honorary membership shall be presented, with reasons therefore in writing, to the Membership Committee. The Membership Committee shall present same with its recommendations to the Executive Council, and, upon the unanimous approval of the Executive Council, the candidate's name shall be presented to the membership at the next annual meeting. The approval of two-thirds of the active members present and voting shall elect the candidate to honorary membership. Upon his election, he shall be presented a certificate of election.

Section 4. Honorary associate membership may be conferred by the Executive Council upon members of Societies of Dentistry for Children of foreign countries when such societies are organized in conformity with the general purpose of the American Society.

Article II—DUES

Section 1. Dues for active members shall be five dollars per year, payable the first day of January. Each State Unit shall pay, on or before April 1, five dollars to the Secretary-Treasurer of this Society for each active member.

Section 2. Honorary members shall not be required to pay dues, and shall be granted all the privileges of membership with the exception of voting and holding office.

Section 3. Dues for associate members and student members shall be two dollars per year, payable the first day of January or through each State Unit on or before April 1.

Section 4. Dues for honorary associate members shall be two dollars per year, payable on January 1st of each year.

Section 5. Any member, not a member of a constituent Unit, who becomes delinquent in the payment of his dues shall be notified by the Secretary at the end of sixty days. Should he continue to be delinquent for thirty days thereafter, his membership shall be declared forfeited.

Section 6. Dues of new members paid during the last quarter of the year shall apply as of January 1st following.

Section 7. A proportionate amount of dues of each paying member shall be designated by the Executive Council as a subscription to the Journal of Dentistry for Children entitling him to receive that publication.

Article III—ELECTION OF OFFICERS

Section 1. (a) All officers except the Editor shall be elected by ballot at the annual meeting, their names having been placed in nomination either by the Nominating Committee or from the floor, and shall assume office at the close of that meeting. (b) The Editor shall be appointed by the Executive Council.

Section 2. No member of the Society shall be eligible for office who has not been a member of the Society for at least three years, but this rule shall not apply to election to committees.

Section 3. No member shall hold the same office twice in succession, except the Secretary-Treasurer and the Editor. The filling of an unexpired term shall, in this regard, be considered a term of office.

Section 4. Permanent or temporary vacancies occurring in office between the election and the next meeting shall be filled by the President for the unexpired term of that office.

Section 5. All nominees for the office of president, president-elect, vice-president and secretary-treasurer must have served at least one term as a member of the Executive Council or as a member of a standing committee of the American Society of Dentistry for Children prior to their nomination.

Article IV—COMMITTEES OR COMMISSIONS

Section 1. Members of the following standing committees or commissions of five members each (six each for Membership and State Units) shall be elected by the Executive Council: Membership, State Units, Public Relations and Publicity, Professional Relations, School and Dental Examining Boards, Community Dental Programs, Constitution and By-Laws, Budget, and Annual Meeting. They are to be elected in the following manner: one for one year, one for two years, one for three years, one for four years, and one for five years; and thereafter *the President* shall appoint one each year for a term of five years. It shall be the duty of the President to designate the chairman of each standing committee, with the exception of the Membership Committee, the chairman of which shall be the Vice-President, and the State Units Committee, the chairman of which shall be the President-Elect.

It shall be the duty of each standing committee to submit to the President, within four months after the annual meeting, a full report of its activities. If such report, or absence of a report, indicates that a committee is not functioning adequately, it shall be mandatory for the President to replace any or all members of such committee as circumstances may indicate necessary to activate it. It shall be the duty of each chairman to present in writing a report of his committee activities to the Executive Council at each annual meeting.

The duties of the Committees shall be as follows:

Membership Committee: To increase the membership of the Society; to receive all recommendations for honorary and honorary associate membership and make appropriate recommendations to the Executive Council.

State Units Committee: To organize new State Units; to assist State Units in their activities; to promote liaison with State Units; to keep the Procedure Manual current and effect its distribution to State Units.

Public Relations and Publicity Committee: To foster cooperation of Society and lay groups organized for the promotion of child health; to stimulate and foster the award of grants to the Society; to give proper notices to the newspapers and other publications where publicity is desired; to assist the proper committee of the American Dental Association in the promotion of the annual national children's dental health day; and to recommend speakers for lay groups.

Professional Relations Committee: To coordinate the activities of the Society with activities of the American Academy of Pedodontics, the American Association of Orthodontics, the American Society of Pediatrics, the American Academy of Pediatrics and other medical and dental organizations which are organized for the promotion of child health; to maintain a roster of approved clinicians on pedodontics and designate suitable clinical programs for state and local dental meetings which emphasize the practice of pedodontics.

School and Dental Boards Committee: To keep a permanent record of the time and the degree of emphasis allotted to the teaching of pedodontics in the various dental colleges; to work with the Council of Dental Education of the American Dental Association in raising the requirements and standards of pedodontic teaching with the giving of proper emphasis to this subject; to maintain liaison with the various state dental boards and dental examiners of other agencies with the view of giving pedodontics proper evaluation in the examination and licensing of dentists.

Community Dental Programs Committee: To study community dental service and dental educational programs for children and set up desirable standards for such programs; to assist when possible in the formation of programs in local communities by working with the State Units when the advice and assistance of the committee is requested; to maintain liaison with the Council of Dental Health of the American Dental Association so that the Society may assist the Council in the promotion of dental health.

Constitution and By-Laws Committee: This committee shall be composed of past presidents and the new member each year shall automatically be the retiring president. This committee shall serve to study the constitution and by-laws and keep it abreast of the developments of the organization, accept suggestions for changes or additions from members for consideration, and report its recommendations.

Budget Committee: This committee shall include the Immediate Past President as a member. It shall prepare and recommend a budget to the Executive Council for its approval prior to the official and annual meeting. It shall also be the duty of this committee to observe closely the management and handling of the budget and report its findings to the Executive Council.

The Annual Meeting Committee: To serve as a liaison body between the host State Unit, the Local Arrangements Committee and this Society. They shall provide and maintain the Guide Manual for Annual Meetings.

To make a budget recommendation covering annual meeting expenses, to the Budget Committee.

To see that appointment of the general chairman of local arrangements for the annual meeting to be made at least two (2) years in advance.

The Annual Meeting Coordinator shall be the member of the Annual Meeting Committee from the area of the host Unit. The Coordinator and General Chairman shall have their State Unit endorsement.

Section 2. There shall be an Editorial and Publication Commission of three members elected by the Executive Council, one for one year, one for two years, and one for three years, and thereafter the President shall appoint one each year for three years, which shall be the term of this office. This commission shall act in an advisory capacity to the Editor of the Journal, and shall assist the Editor in gathering material suitable for publication in the Journal of Dentistry for Children. It shall examine and recommend on the cost of the Journal, and shall establish the policy on advertisements suitable for insertion in the Journal, based upon standards set by the American Association of Dental Editors. This commission shall also establish the scale of cost of these advertisements.

Section 3. The President shall be empowered to appoint such special committees as he deems needful at any time; or, on the majority vote of the members present at any official meeting of the Society he shall appoint committees as they direct.

Section 4. At least thirty days prior to the annual meeting of the Society, the President shall appoint and publish the personnel of two committees: (1) A Nominating Committee composed of three members to present candidates for election to office for the following year. (2) An Auditing Committee composed of three members to audit the Treasurer's books.

Article V—RULES OF ORDER

The Society shall be governed in all matters not covered by the Constitution and By-Laws by Robert's "Rules of Order Revised."

Article VI—DUTIES OF OFFICERS

Section 1. It shall be the duty of the President to preside at all meetings of the Society and of the Executive Council; to approve bills for payment; sign all documents; appoint and notify all committees not otherwise provided for; present an annual address, and perform such other duties as are customary to his office.

Section 2. The President-Elect shall arrange the program and preside at the joint meeting of the State Unit delegates.

Section 3. The Vice-President shall assume the duties of the President in his absence.

Section 4. It shall be the duty of the Secretary-Treasurer: to keep a record of the transactions of the Society and of the Executive Council; to attend to all correspondence; keep all official letters received, with a copy of replies to same; to publish notice to all members of time and place of meetings; to notify officers, applicants for membership, committees, and others of their election or appointments; and, to keep an accurate list of members, together with their addresses.

He shall be responsible for the collection of all monies due the Society from its members and constituent Societies.

He shall secure annual meeting headquarters hotel in cooperation with the Annual Meeting Coordinator, at least one (1) year in advance.

At the expiration of his term of office he shall turn over to his successor all records, books, or other properties relating to his office and perform all other duties pertinent to his office.

He shall keep all monies belonging to the Society, and pay out same, provided the money is in hand, upon the presentation of a properly approved voucher.

He shall furnish a bond, at the expense of the Society, for an amount designated by the Executive Council.

He shall, ninety days before the annual meeting, notify the secretary of each Unit of the number of official delegates and alternates to which they are entitled and shall provide them with official forms. The secretary of the Unit shall in turn, thirty days before the annual meeting, return these forms with names of delegates and alternates and duly endorsed by the Unit president or secretary.

The Unit secretary shall then be mailed proper credentials for each delegate and alternate, and voting privileges of these delegates and alternates at annual meetings shall be dependent upon the presentation of these credentials at the time of registration.

He shall make an accurate report of the Society's Treasury at the annual meeting.

The Secretary-Treasurer shall be paid a salary of one-dollar per year.

Section 5. At the conclusion of each officer's term of office and at the annual meeting, each officer shall surrender his manual to his successor.

Article VII—EXECUTIVE COUNCIL

Section 1. The Executive Council shall consist of the President, the President-Elect, the Vice-President, the two immediate Past-Presidents, the Secretary-Treasurer, the Editor, and four other members to be elected the first year as follows: two for one year, and two for two years, each being replaced as his term expires by a member elected to the Council for a term of two years which shall be the term of this office thereafter.

The Editor shall hold his office from year to year at the pleasure of the Executive Council. The Editor shall have the power to appoint an assistant Editor, and contributing Editors for a term of one year.

Section 2. Those members of the Executive Council present at a regularly called meeting shall constitute a quorum. Special meetings of the Council may be held at any time and place that a quorum may be gathered, each member of the Council having received notification.

Section 3. The Executive Council shall conduct the business of the Society between annual meetings. It shall adopt the budget for the Society and approve the expenditure of the Society's money by appropriation to the various committees or for other special purposes. It shall elect such officers and committees as specified in the By-Laws. It shall render a full and complete report to the Society of all of its actions as well as of all matters brought before it, which when approved by the Society becomes the action of the Society.

Section 4. The Executive Council, meeting and voting jointly with the delegates at the annual meeting, shall elect a member of the Board of Pedodontics. Candidates for election to this position shall be diplomates of the Board.

Section 5. The Executive Council shall be empowered to select and recommend for approval to the delegate body an executive secretary whether it be an individual or a commercial firm with salary, length of contract and duties to be clearly specified. Upon approval of the delegate body contract for such services shall be negotiated by the President and Secretary. It shall be the duty of the Executive Council to arrange for suitable office space to be designated as Headquarters of the Society.

Pedodontic Terminology

L. W. Teutsch, D.D.S., M.S.D., Omaha, Nebraska

A NEW book by George B. Denton, Ph.D., entitled *The Vocabulary of Dentistry and Oral Science* published in 1958 by the Bureau of Library and Indexing Service of the American Dental Association has prompted the writer to submit this article.

A standardization of terminology used in Dentistry for Children is desirable. Among those dentists who deal primarily with children, Pedodontics is employed as a synonym of Dentistry for Children. This specialty has been called children's dentistry, juvenile dentistry, and pedodontia. These are now undesirable terms to use. Pediodontia is incorrect. The suffix -ics, through special use, has developed into the ending best qualified to designate a practice.

In the naming of the first dentition, there lies a problem of terminology—terms used are deciduous, temporary, baby, milk, first, primary and foundation. Sound arguments exist to discourage the use of the terms temporary, baby, milk, first and foundation to describe the first dentition. Several years ago, the American Academy of Pedodontics recommended the use of the term primary to represent the first dentition. The American Society of Dentistry for Children once had a slogan, "The primary teeth rate primary importance." The style of the *Journal of the American Dental Association* requires the term deciduous in all literature designed for the profession and allows primary only in discourse for non-professional persons.

The terms pulpotomy and partial pulpectomy are commonly used in pedodontics. Other terms used to describe a surgical technique are: pulp curettage, direct pulp capping and pulp amputation. Pulpectomy is the operation wherein the entire pulp tissue is removed from a tooth. Pulpotomy is known as the operation which removes the coronal pulp of a tooth. The term pulpotomy is not a good term. The term partial pulpectomy has the same connotations as pulpotomy, but is incorrect terminology. When referring to a surgical procedure involving the pulp, the term pulp amputation is preferred.

Errors can be made in describing the pulp amputation technique. The expression de-vital pulpotomy is incorrect. The prefix de- is used only with verbs; it cannot be prefixed to adjectives, such as vital. The sense intended can be secured by the use of non-vital or devitalized (vitalize being a verb).

The pedodontist or the dentist who may limit or include children in his practice has a responsibility to supervise the occlusion of the developing primary and the developing permanent dentition. Terms relating to the treatment of the occlusion are: Corrective orthodontics, interceptive orthodontics, palliative orthodontics, and preventive orthodontics.

Preventive orthodontics is best demonstrated when the dentist places a space maintainer after removing a primary tooth. This simple procedure prevents loss of space and the development of an orthodontic problem.

Preventive dentistry is foremost in the minds of the profession today. Dentistry for Children is the key to prevention.

• From *The Chronicle* of the Omaha District Dental Society.

Topical Treatment of the Teeth With Stannous Fluoride—Single Application Technique

JOSEPH C. MUHLER, D.D.S., Ph.D.

EDITOR'S NOTE: *Due to the many requests received by Dr. Muhler in response to his progress report published in our 3rd Q 1958 issue, we asked him to prepare a comprehensive résumé of the technic for application of stannous fluoride, which we present herewith.*

Certainly the data published seem to indicate the use of stannous fluoride for topical applications to the teeth is preferable to the use of sodium fluoride, because of greater efficacy and saving of chair time, resulting in better service to our patients.

Stannous floride for use by the dentist in his office may be obtained without charge by a request to Dr. J. C. Muhler, Indiana University School of Dentistry, 1121 W. Michigan St., Indianapolis 7, Indiana.

A.E.S.

A PREVIOUS communication[1] has discussed in detail the technique of topical application to the teeth of a series of four applications of stannous fluoride, together with the recommended method of preparing the fluoride solution. However, since this paper has appeared, data have become available to support the recommendation of a new technique involving only one application of stannous fluoride. This paper will describe the new technique and review the supporting evidence for its use. The clinical studies of Gish, Howell, and Muhler[2, 3, 4] have demonstrated the superiority of a single application of an 8 per cent solution of stannous fluoride applied once a year when compared to a series of four applications of a 2 per cent solution of sodium fluoride applied once every three years. Furthermore, a significant anticariogenic effect has been shown by Muhler[5] to result from a single application of an 8 per cent solution of stannous fluoride applied every six months in children living in an area having fluoridated water. Muhler[6] has also reported that a single application of a 10 per cent solution of stannous fluoride significantly reduces the dental caries experience in adults. Taken collectively, these studies emphasize the advantages of using the single application technique when stannous fluoride is used as the topical agent. Of course, repeated, independent corroboration *(Since these original data were obtained, Jordon [State Board of Health, Minneapolis, Minnesota] has repeated the study in children and at the end of two years has found a reduction in dental caries of 40 per cent.) (Reported at the 99th general session of the A.D.A., Dallas, Texas.)* and extension of these studies are needed in order to demonstrate the utility of the clinical procedures and determine the effectiveness of the compound. However, the extensive use of this compound by general practitioners and the overwhelming number of reports from these dentists indicating anticariogenic effec-

tiveness further suggest the acceptance of the single application technique.*

Technique of Application to the Teeth

In order to obtain the maximum benefit from stannous fluoride, the following precautions should be strictly observed. At the time of the initial visit, a thorough prophylaxis is performed. Extreme care must be taken to clean and polish thoroughly with pumice each available tooth surface. This includes the stripping of every interproximal surface. Toothbrushing, as a substitute for the prophylaxis, is not satisfactory.

Immediately following the prophylaxis, the stannous fluoride is applied to the teeth. It is considered best to treat only one quadrant of the dental arch at a time, since saliva must remain completely absent from the teeth. However, some dentists can satisfactorly use the Garmer or similar cotton roll clamp to hold the cotton rolls in place, thus making it possible to treat one-half of the mouth at a time. Others prefer to treat the maxillary arch separately and the mandibular arch in two parts. In any event, the paramount precaution is to keep the teeth entirely free from saliva, and the particular technique one chooses should be the one which most satisfactorily maintains these conditions.

The particular teeth to be treated are completely isolated with cotton rolls and thoroughly dried with air. The stannous fluoride is then applied with a cotton applicator, keeping the teeth moist with the stannous fluoride solution throughout a four-minute period. This usually means a re-application every 15-30 seconds, depending upon the particular affinity of the enamel for the fluoride solution. After all of the teeth in the mouth are similarly treated, the patient is dismissed with the precaution not to eat, drink, or rinse his mouth for at least thirty minutes.

The frequency of treatments following the initial one will depend mainly upon the prevalence of dental caries in the individual patient. If the patient is highly caries-susceptible, the dentist will need to repeat the single application each six months, or even more frequently. If the child is not highly susceptible, the single treatment can be given once a year. However, it is considered a good preventive principle to give a single application each time the child presents for a routine clinical and x-ray examination. In order to perform properly such a clinical examination a thorough prophylaxis must be given, and following such a procedure only a few additional minutes are required to give the topical stannous fluoride treatment.

Technique for Preparation of the Stannous Fluoride Solution

The clinical effectiveness of stannous fluoride depends on the maintenance of the stannous tin in an active state. To insure that the solution of stannous fluoride has a maximum percentage of stannous tin in an active form, the solutions must be prepared fresh for each treatment and used immediately. This is most conveniently accomplished by having a

* Stannous fluoride for use by the dentist in his office as a part of his preventive dentistry program may be obtained, gratis, by writing directly to Indiana University School of Dentistry, 1121 West Michigan Street, Indianapolis 7, Indiana.

pharmacist weigh 0.80* gm. portions of solid stannous fluoride into No. 0 gelatin capsules. It is important to keep the filled capsules containing the solid stannous fluoride in a container which can be sealed tightly after the removal of individual capsules. Similarly, the unmeasured stannous fluoride should be sealed tightly against air and moisture. These precautions will aid in preventing oxidation and hydrolysis of the surface crystals of stannous fluoride.

Immediately before use, the contents of a single capsule are added to 10 ml. of distilled water and shaken briefly. The solution is conveniently mixed by stirring it with the cotton-free end of the wooden cotton applicator which will subsequently be used to apply the solution to the teeth. Many dentists find it convenient to have a 25 ml. polyethylene bottle in which to mix the solution. After the entire contents have completely dissolved, the solution is applied immediately to the teeth. The 10 ml. of solution should suffice to treat the entire mouth of a single patient. If any is left after treatment, it should be discarded.

No flavoring or coloring agent should be added to the stannous fluoride solution. Any attempts to "mask" the unpleasant taste have decreased the anticariogenic effectiveness of the topical stannous fluoride solution by decreasing the availability of stannous ion. The use of high concentrations of any heavy metal, such as the tin moiety of this solution, is associated with an unpleasant astringent taste which, however, can be minimized into insignificance by properly preparing the child before giving the topical application. Simply informing him in advance in an honest manner of the unpleasant taste will do much in most cases toward eliminating this problem entirely. This application of psychology is somewhat akin to the rationale for intramuscular injections. Certainly we would not prohibit the use of intramuscular antibiotics simply because of the temporarily unpleasant "feel" of the needle.

The topical application of stannous fluoride frequently elicits a copious flow of saliva, which may interfere with isolation of the teeth during the fluoride application. Many dentists have reported that 50 mg. Banthiene,* given 30 minutes prior to the topical treatment greatly reduces saliva flow.

Pigmentation of the Teeth Following Stannous Fluoride Application

Considerable concern has been shown by a few dentists in regard to pigmentation of the teeth after using a highly concentrated solution of stannous fluoride. Pigmentation of the teeth definitely occurs following the use of concentrated stannous fluoride solutions if a pre-carious or carious lesion is present. Pigmentation is considered highly beneficial and is interpreted by us as an extremely useful result of the fluoride treatment. It has been our observation that no tooth surface will be pigmented that does not have a pre-carious lesion present. There is definite evidence** that only the frank

* If stannous fluoride is to be used for adults, the clinical tests which have been conducted in order to determine its effectiveness have used a 10 per cent solution instead of the 8 per cent solution recommended for children. Thus the capsule should contain 1.0 gm. of solid stannous fluoride if it is to be dissolved in 10.0 ml. of distilled water.

* One may obtain a Banthiene-Phenobarbital preparation which is useful in both reducing temporarily salivary volume as well as reducing the anxiety of the young patient.

** See Muhler, J. C., Effect on Gingiva and Occurrence of Pigmentation of Teeth Following the Topical Application of Stannous Fluoride or Stannous Chlorofluoride, J. Periodontology 28:281, 1957.

carious lesion becomes pigmented, and that the non-carious surfaces show no color change. This is encouraging since the former represents, in our opinion, caries arrestment. We have had the opportunity to follow many of these pigmented lesions for periods of time as long as three years, and many have not as yet broken down. In essence, then, this pigmentation is decreasing the rate at which the carious process destroys tooth structure, with the result that the dentist will find himself with sufficient time to restore such lesions before they progress too far. The use of cocoa butter or vaseline to cover anterior silicates with poor margins is discouraged on these grounds. Essentially a carious lesion has only three fates: (1) to continue to progress; (2) to be restored; or (3) to become arrested. Modern dentistry teaches that about 70 per cent continue to progress, 25 per cent will be restored, and less than 5 per cent of the carious lesions will become spontaneously arrested. The objectives of the single topical technique are to preserve sound teeth and to decrease the rate of progression of carious lesions until operative dentistry can restore them with well established techniques of restorative dentistry. In many instances, the incipient lesion may not need to be restored, thus permitting the dentist more time to see additional patients. In doing so his preventive services will be significantly increased.

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Book Reviews

DENTISTRY FOR CHILDREN. By John C. Brauer, William W. Demeritt, L. B. Higley, Roy L. Lindahl, Maury Massler, and Isaac Schour. Fourth Edition. 492 pages. Index. New York, Toronto, London. The Blakiston Division McGraw-Hill Book Company, Inc. 1958.

Under one cover entitled *Dentistry for Children* are the writings of six qualified authors, each an expert in his field.

The text is current, broad, informative, authoritative, practical, and includes a complete bibliography following each chapter to permit the most insatiable reading desire to be satisfied. Every aspect of dentistry for children is well covered and abundantly illustrated, including such preventive orthodontics, space maintenance, prosthetic dentistry, endodontics and an excellent chapter on fractured and displaced anterior teeth.

This fourth edition adds a new co-author, Dr. Roy L. Lindahl, who has written the chapter on oral surgery.

In addition this fourth edition permits the other co-authors to revise and bring up to date the previous text.

The value of this book is unsurpassed as a finger-tip reference and is a must for every man in this field of dentistry.

PIERCE A. MCLEAN

HANDICAPS AND THEIR PREVENTION, C. C. Fischer, ed. Philadelphia, W. B. Saunders, 1957. viii + 206 p.

This book represents part of a total work sponsored by the Pediatric Clinics of North America. Though a comparatively small book, it is a qualitative giant in information that is critically presented on current attitudes in prevention and care of children with handicaps. It could easily be adapted into an organizational handbook for any group that would wish to devote its efforts toward the handicapped child. The more significant purpose permits those who care for children to relate and combine their efforts since the total care of any child with a handicap has outgrown the ability of any individual to meet them successfully.

The broadest possible definition of a handicapped child is used: "A child is considered to be handicapped if he cannot within limits play, learn, work, or do the things other children of his age can do; if he is hindered in achieving his full physical, mental, and social potentialities."

The symposium is presented in four sections. The first deals with the prevention; the second with care; the third with education and therapy; and the fourth with the community and the handicapped child.

To comprehend the enormity of the problems, a study* is utilized to dramatically indicate prevalence:

—"the numbers of children per 1000 under 21 having each of the following type of defect may be estimated as follows: cosmetic, 43; mental retardation, 40; personality disturbance, 29; speech, 29; eye and vision, 24; hearing, 19; orthopedia, 17; orthodontic, 16; cardiac, 10; cerebral palsy, 5; epilepsy, 4; cleft palate and lip, 1. Because of the multiplicity of defects in at least two thirds of this group, this results in a total of

* Wishik, S. M. Handicapped children in Georgia: a study of prevalence, disability, needs, and resources. Am. J. Pub. Health, 46:195, 1956.

237 defects per 1000 children, a truly astounding figure."

The edited clinics presented in this book are most respectfully reviewed as works of merit and value to medicine and ancillary fields.

MARVIN DAVIS

CLINICAL APPLICATION OF HYPNOSIS IN DENTISTRY, S. I. Shaw, Philadelphia, W. B. Saunders, 1958. xi + 173 p.

Those who know Dr. Shaw recognize this book as a beautifully filtered and refined presentation of many years of thought, training, and experience in both dentistry and psychology. It is not a large book, since what it has to say is accomplished with brevity. But it is a brevity which belongs to the scholar who has mastered the technic of teaching his subject in the most practical manner. Ethical hypnosis is such a valuable dental ally, that it is a little surprising to find resistance to its use. Perhaps all that is required is an increased understanding of hypnosis and how it is brought about. This book uniquely extends this information with suitable dignity.

The qualifications of a dentist to study the use of hypnosis do not include or demand special skills other than an understanding of human dynamics and the expression of kindness and intelligence.

The successful technics to induce hypnosis for dental purposes are presented with such order and clarity that the reader may recognize and utilize various stages of hypnosis from simple suggestion to deep trance as workable capabilities of the mind . . . completely divested of the theatrical taint.

Dr. Shaw covers the dangers of hypnosis as well as the benefits. He also works within the framework for understanding the individual as a total person with many needs and influences guiding his actions.

A most valuable use of this book will be as a supplement to the teacher of hypnodontics. It is also fine preparation for such intended courses and an excellent auxiliary to enhance the patient-dentist relationship through suggestion.

MARVIN DAVIS

HANDBOOK OF SPEECH PATHOLOGY, L. E., Travis, ed. New York, Appleton-Century-Crofts, c 1957. viii + 1088 p.

This is a major text on speech and although it is a basic work intended to be used in conjunction with formal education and the facilities of seminar and clinic, it is a very welcome reference book for those who are in allied fields. The book comes to dentistry's direct attention by reason of chapters 19, pathomorphology of cleft palate and cleft lip; chapter 20, speech problems of the person with cleft palate and cleft lip; and chapter 21, speech defects associated with dental abnormalities and malocclusions. But those who have studied speech problems will know that the understanding of speech pathology involves the total individual and his environment. How magnificent then to find this book which calls upon the learnedness of many recognized clinicians, scholars, and teachers of speech pathology, each contributing a chapter of their own specialty. The complete amount of information is thereby prodigious.

The work is an excellent introduction to many facets of speech; definitions, mechanics, etiologies, diagnoses, meas-

urements, evaluation, care, and philosophy.

The major portion of the book is devoted to basis consideration in speech pathology and speech and voice disorders associated with organic abnormalities. The last third of the book is devoted to speech and voice disorders unrelated to organic abnormalities, and psychotherapy and speech therapy. Although there may be little immediate dental relationship, these latter areas of discussion are simply fascinating in their remarkable insight and contribute immensely to the reader's knowledge of human dynamics. Dentistry has evolved closer to the need for understanding the individual beyond the implication of the oral problems alone and since the incidence of speech defects appears to lie somewhere between 4 to 5 per cent of our population, some knowledge of speech problems increases the value of the dentist to his community.

This book is so vitally interesting that it cannot help but engender further study. Dental libraries will considerably add to their reference fund with this addition.

MARVIN DAVIS

INDEX

Volume XXV, 1958

Subjects and Titles

Abstracts: 126, 224, 288
Advanced Suppurative Periodontitis Associated With Avitaminosis "A": 45
Adverse Factors in the Developing Occlusion: 275
Aids in Pedodontic Prosthontics: 160
Book Reviews: i, i, 310
Comments on Case Report of Dr. Sud: 49
Constitution and By-Laws—As Revised November 1957: 298
Dental Caries and a Consideration of the Role of Diet in Prevention—Report of Joint Committee of the American Academy of Pediatrics and American Society of Dentistry for Children: 289
Dental Rehabilitation of Crippled Children With the Aid of General Anesthesia: 25
Diseases of the Oral Soft and Supporting Tissues of Children: 169
Editorial: 196
From Your President: 2, 167
Growth and Development of the Child: 99
How Much Orthodontics Shall the Pedodontist Do?: 3
Internal Resorption or Caries?: 156
Miami Beach, 1957—Pictorial Review: 9
Minutes of the Meeting of the Executive Council and Business Session of the American Society of Dentistry for Children—1957: 31
New Executive Secretary: 229
Obituary—Jacob M. Wisan: 274
Of the Mortality of Young Children at the Time of Teething: Part I—51, Part II—116
Oral Surgery for the Cerebral Palsied Child: 200
Pedodontic Terminology: 305
Pulp Amputation and Healing: 84
Quadrant Dentistry for Children: 180
Report of a Case With Supernumerary Teeth and Treatment: 212
Responsibility for Tooth Guidance Procedures: 205
Space Maintenance: 130
Stannous Fluoride vs. Sodium Fluoride—A Progress Report: 177 (see also p. 306)
The Endodontic Management of the Young Permanent Tooth: 215
The Finger Sucking Habit and Associated Problems: 145
The Role of Children's Dentistry in the Next Decade: 135
Topical Treatment of the Teeth With Stannous Fluoride—Single Application Technique: 306
Tranquilizers in Dentistry for Children: 269
25th Anniversary of the New York State Society of Dentistry for Children: 152
Ultra High Speed Technics in Dentistry for Children: 231
Unit News: 15, 105, 184, 257

Authors

Addelston, Harold K.: Of the Mortality of Young Children at the Time of Teething—A Translation: Part I—51, Part II—116
Beder, Oscar E.: Aids in Pedodontic Prosthodontics, 160
Berman, David S.: Pulp Amputation and Healing, 84
Bhatia, Harbans L.: Quadrant Dentistry for Children, 180
Brauer, John C.: The Role of Children's Dentistry in the Next Decade, 135
Dobbs, Edward C.: Tranquilizers in Dentistry for Children, 269
Dunn, Naomi A.: Adverse Factors in the Developing Occlusion, 275
Eichenbaum, Irving W.: Adverse Factors in the Developing Occlusion, 275
Ferguson, Theodore R.: Quadrant Dentistry for Children, 180
Fisher, Granville C.: Growth and Development of the Child, 99
Fechtner, Jerome L.: Ultra High Speed Technics in Dentistry for Children, 231

Gish, Charles W.: Stannous Fluoride vs. Sodium Fluoride—A Progress Report, 177
Graber, T. M.: The Finger Sucking Habit and Associated Problems, 145
Greer, M. E.: Dental Rehabilitation of Crippled Children With the Aid of General Anesthesia, 25
Howell, Charles L.: Stannous Fluoride vs. Sodium Fluoride—A Progress Report, 177
Law, David B.: Space Maintenance, 130
Levitas, Ted: Unit News, 15, 105, 184, 257
Luten, J. Randle, Jr.: Internal Restoration or Caries?, 156
Marion, Edith S.: Of the Mortality of Young Children at the Time of Teething—A Translation: Part I—51, Part II—116
Muchnic, Herbert V.: Responsibility for Tooth Guidance Procedures, 205
Muhler, Joseph C.: Stannous Fluoride vs. Sodium Fluoride—A Progress Report, 177
Muhler, Joseph C.: Topical Treatment of the Teeth With Stannous Fluoride—Single Application Technique, 306
Patterson, Samuel S.: The Endodontic Management of the Young Permanent Tooth, 215
Poulton, Donald R.: Report of a Case With Supernumerary Teeth and Treatment, 212
Pruzansky, Samuel: Report of a Case With Supernumerary Teeth and Treatment, 212
Rattner, Lewis J.: Dental Rehabilitation of Crippled Children With the Aid of General Anesthesia, 25
Sanders, Douglas J.: Tranquilizers in Dentistry for Children, 269
Selman, Abbe J.: Oral Surgery for the Cerebral Palsied Child, 200
Shamer, David H.: Tranquilizers in Dentistry for Children, 269
Sud, Vimla: Advanced Suppurative Periodontitis Associated With Avitaminosis "A," 45
Teutsch, L. W.: Pedodontic Terminology, 305
Zander, H. A.: Comments on Case Report of Dr. Sud, 49